

# PATENT ABSTRACTS OF JAPAN

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## (54) WIRELESS COMMUNICATION UNIT AND WIRELESS COMMUNICATION SYSTEM

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a wireless communication unit that fuses an interrogator in an RFID system with a full-dress two-way wireless communication unit such as a wireless LAN and a mobile phone with a simple configuration and to provide a wireless communication system employing the wireless communication unit.

**SOLUTION:** The wireless communication unit 4 can communicate with other wireless communication unit 19 and a wireless tag 3. In the case of making communication with the other wireless communication unit 19 and the wireless tag 3, the wireless communication unit

4 makes communication by using a transmission source 40, a modulator 42, a transmission RF section 44, a transmission/reception separator 45 and a 2-way wireless transmission/reception/wireless tag transmission/reception common antenna 46, which are in common to those of the other wireless communication unit 19 and the wireless tag 3. A demodulator 48 demodulates a signal received from the other wireless communication unit 19 and a wireless tag demodulator 49 demodulates the signal received from the wireless tag 3. Through the configuration above, one set of the wireless communication unit 4 can communicate with the other wireless communication unit 19 and the wireless tag 3 and the unit can be built up at a lower cost with a smaller size.

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## CLAIMS

[Claim(s)]

[Claim 1] A bidirectional radio means to modulate the subcarrier sent from the source of transmission, to transmit to other radio communication equipments from an antenna, to receive the signal from other radio communication equipments with an antenna, and to get over. A signal is transmitted for the subcarrier sent from the source of transmission to a wireless tag from an antenna in a modulation or no becoming irregular. The radio communication equipment characterized by having the question means which reads the information which receives the signal which answers this signal, becomes irregular based on the information memorized, and is transmitted from a wireless tag with an antenna, gets over, and is memorized by the wireless tag.

[Claim 2] The source of transmission which sends the subcarrier of said bidirectional radio means, and the source of transmission which sends the subcarrier of a question means are a radio communication equipment according to claim 1 characterized by the common thing.

[Claim 3] The antenna of said bidirectional radio means and the antenna of said question means are a radio communication equipment according to claim 1 or 2 characterized by the common thing.

[Claim 4] The antenna of said bidirectional radio means and the antenna of said question means are a radio communication equipment according to claim 1 or 2 characterized by being prepared separately, respectively.

[Claim 5] The antenna of said bidirectional radio means and the antenna transmitted to the wireless tag of said question means are a radio communication equipment according to claim 1 or 2 characterized by the common thing.

[Claim 6] The modulation of the subcarrier of said bidirectional radio means and the modulation of the subcarrier of said question means are the radio communication equipment of any one publication of claim 1-5 characterized by becoming irregular with a common modulation means.

[Claim 7] The recovery of the signal transmitted from other radio communication equipments and the recovery of the signal transmitted from a wireless tag are the radio communication equipment of any one publication of claim 1-6 characterized by

getting over with a common recovery means.

[Claim 8] A modulation means to modulate the subcarrier which sent said bidirectional radio means in the source of transmission which sends a subcarrier, and said source of transmission, The bidirectional wireless transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication equipments, It has a recovery means to restore to the signal received from other radio communication equipments. Said question means The wireless tag transmitting antenna which transmits a signal to a wireless tag using the subcarrier sent in the source of transmission of said bidirectional radio means, The radio communication equipment according to claim 1 characterized by having the wireless tag receiving antenna which receives the signal transmitted from a wireless tag, and a wireless tag recovery means to restore to the signal received with the wireless tag receiving antenna.

[Claim 9] A modulation means to modulate the subcarrier which sent said bidirectional radio means in the source of transmission which sends a subcarrier, and said source of transmission, The bidirectional wireless transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication equipments, It has a recovery means to restore to the signal received from other radio communication equipments. Said question means The wireless tag transmitting antenna which transmits a signal to a wireless tag using the subcarrier sent in the source of transmission of said bidirectional radio means, The radio communication equipment according to claim 1 characterized by restoring to the signal which is equipped with the wireless tag receiving antenna which receives the signal transmitted from a wireless tag, and is transmitted from a wireless tag with the recovery means of said bidirectional radio means.

[Claim 10] The radio communication equipment according to claim 9 characterized by having the signal coupler which combines alternatively with a demodulator the signal transmitted from the signal or wireless tag transmitted from other radio communication equipments.

[Claim 11] The bidirectional wireless transceiver antenna of said bidirectional radio means and the wireless tag transmitting antenna of a question means are the radio communication equipment of any one publication of claim 8-10 characterized by being a common antenna.

[Claim 12] The radio communication equipment of any one publication of claim 8-11 characterized by having the signal eliminator which sends the signal transmitted from

the wireless tag which received the signal from the source of transmission with delivery and an antenna at the antenna to a recovery means to restore to this signal. [Claim 13] The radio communication equipment of any one publication of claim 8-12 characterized by forming the transmission-and-reception eliminator which separates the sending signal to other radio communication equipments, and the input signal from other radio communication equipments.

[Claim 14] The radio communication equipment of any one publication of claim 1-13 characterized by restoring to the signal transmitted from a wireless tag using a part of subcarrier sent in the source of transmission.

[Claim 15] It is the radio communication equipment according to claim 2 which said source of transmission is established in a bidirectional radio means, and is characterized by said bidirectional radio means having the antenna which transmits a signal to a wireless tag.

[Claim 16] Transmission and reception of the signal to other radio communication equipments which a bidirectional radio means performs, and transmission of the signal to a wireless tag are a radio communication equipment according to claim 15 characterized by being carried out by the common antenna.

[Claim 17] Transmission and reception of the signal to other radio communication equipments which a bidirectional radio means performs, and transmission of the signal to a wireless tag are a radio communication equipment according to claim 16 characterized by being carried out by the separate antenna.

[Claim 18] A question means is the radio communication equipment of any one publication of claim 15-18 characterized by having the antenna which receives the signal transmitted from the signal and bidirectional radio means which were modulated based on information with the wireless tag.

[Claim 19] A question means is the radio communication equipment of any one publication of claim 15-18 characterized by having separately the antenna which receives the signal modulated based on information with the wireless tag, and the antenna which receives the signal transmitted from the bidirectional radio means.

[Claim 20] A modulation means to modulate the subcarrier which sent said bidirectional radio means in the source of transmission which sends a subcarrier, and said source of transmission. The bidirectional transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication equipments, it has a recovery means to restore to the signal received from other radio communication equipments. Said question means The bidirectional wireless receiving antenna which receives the

signal transmitted from the bidirectional transceiver antenna of said bidirectional radio means. The radio communication equipment according to claim 2 characterized by having the wireless tag receiving antenna which receives the signal transmitted from a wireless tag, and the recovery means which carries out the mixed recovery of the signal received with these antennas.

[Claim 21] The bidirectional wireless receiving antenna and wireless tag receiving antenna of said question means are a radio communication equipment according to claim 20 characterized by the common thing.

[Claim 22] The radio communications system characterized by consisting of the radio communication equipments and wireless tags of any one publication of claim 1-21.

[Claim 23] It is the radio communications system according to claim 22 which can write information in said wireless tag and is characterized by the ability of a radio communication equipment to write information in a wireless tag on radio.

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**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the radio communication equipment and radio communications system which have a RFID function and a bidirectional radio function.

[0002]

[Description of the Prior Art] Conventionally, there is a communication device using wireless. Drawing 14 is drawing showing the basic configuration of the common bidirectional radio communication equipments 1, such as wireless LAN (Local

AreaNetwork) and a portable telephone. The bidirectional radio communication equipment 1 and other radio communication equipments 19 which perform bidirectional radio are shown in drawing 14. Other radio communication equipments 19 are other bidirectional radio communication equipments and base transceiver stations where the bidirectional radio communication equipment 1 communicates.

[0003] The transmitting RF (Radio Frequency) section 22 to which the bidirectional radio communication equipment 1 changes from the source 20 of transmission, a modulator 21, power amplification, a filter, etc., and the signal transmitted to other radio communication equipments 19. The signal transmitted from a radio communication equipment 19. The receiving RF section 25 which consists of the transmission-and-reception eliminators 23, such as a switch to separate or a diplexer, the antenna 24 which a signal transmits and receives, low noise amplifier, a filter, etc., the demodulator 26 which restores to the received signal the data transmitted to other radio communication equipments 19. It is constituted including the recovery signal output part 28 which takes out the information signal input section 27 to input, data, etc. Although the signal-processing section which otherwise processes the data inputted into a modulator 21 from the information signal input section 27 in the bidirectional radio communication equipment 1, the synthesizer control section for changing the frequency of the subcarrier sent in the source 20 of transmission in performing the FURIKEN C hopping which changes the frequency of a signal to transmit, etc. are required, it omits in drawing 14. The transmission-and-reception eliminator 23 uses a switch or a diplexer properly with TDD (Time Division Duplex) or a FDD (Frequency Division Duplex) method.

[0004] The bidirectional radio communication equipment 1 of drawing 14 explains actuation below as a communication device of a TDD method. The subcarrier sent in the source 20 of transmission of the bidirectional radio communication equipment 1 is modulated with a modulator 21 by the information signal inputted from the information signal input section 27. The modulating signal modulated with the modulator 21 is transmitted toward other radio communication equipments 19 through the transmitting RF section 22 and the transmission-and-reception separation section (switch) 23 from an antenna 24. On the other hand, an antenna 24 receives, it restores to the modulating signal transmitted to the bidirectional radio communication equipment 1 from other radio communication equipments 19 with a demodulator 26 via the transmission-and-reception eliminator 23 and the receiving RF section 25, and an information signal is taken out from the recovery signal output part 28. Actuation of the above bidirectional radio communication equipment 1 is actuation of general

bidirectional radio.

[0005] Drawing 15 is drawing showing the interrogator 2 and the wireless tag 3 of a common RFID system. An interrogator 2 is the communication device which used wireless, and is constituted including the demodulator 34 which consists of the signal eliminator 32 which consists of the source 30 of transmission, a modulator 31, a circulator, a directional coupler, etc., an antenna 33, a synchronous detector, etc., the tag information recovery signal output part 35, etc. Although the information signal input section which inputs the transmit data to RF transmitting section, RF receive section, the signal-processing section, and the wireless tag 3 is required for others, it is omitting in drawing 15. The wireless tag 3 is constituted including the memory 39 which records the tag recovery section 38 which restores to the tag antenna 36 which receives the signal from an interrogator 2 and transmits a signal to an interrogator 2, the tag modulator 37 which modulates the signal transmitted to an interrogator 2, and the signal received with the tag antenna 36, data, etc.

[0006] Below, actuation of an interrogator 2 and the wireless tag 3 is explained. When reading the information on the wireless tag 3, an interrogator 2 becomes irregular with a modulator 31, and the subcarrier sent in the source 30 of transmission of an interrogator 2 is transmitted from an antenna 33 through the signal eliminator 32. It is received by the tag antenna 36 of the wireless tag 3, and the modulating signal transmitted from an antenna 33 receives a modulation using the are recording information on memory 39 with the tag modulator 37 of the wireless tag 3. The signal modulated with the wireless tag 3 is transmitted to an interrogator 2 from the wireless tag 3. An interrogator 2 receives the signal transmitted from the wireless tag 3 with an antenna 33. The modulating signal received with the antenna 33 is inputted into a demodulator 34 through the signal eliminator 32, and after getting over with a demodulator 34, it is taken out from the tag information recovery signal output part 35. In writing information in the wireless tag 3, using write-in information, the subcarrier sent in the source 30 of transmission with a modulator 31 is modulated, and it transmits to the wireless tag 3, and with the wireless tag 3, it restores to the received modulating signal in the tag recovery section 38, and writes in memory 39. Actuation of the above interrogator 2 and the wireless tag 3 is actuation of the RFID system generally known well.

[0007] From the former, the RFID system is utilized in FA (Factory Automation) business etc. In recent years, it is broadly used for the picking system which classifies stock control and an article in the PD or the circulation field by the miniaturization of a wireless tag, or dc-battery loss-ization. The information on the wireless tag

acquired by the interrogator is immediately sent to an access point using bidirectional radio communication equipments, such as wireless LAN prepared apart from the interrogator, and is processed in the management processing section, and the gestalt which manages goods often consists of such PD and the circulation fields. Moreover, also when writing information in a wireless tag, it is performed by the directions from the management processing section using an interrogator.

[0008]

[Problem(s) to be Solved by the Invention] Although the conventional bidirectional radio communication equipment 1 mentioned above has the function which communicates with other bidirectional radio communication equipments, it does not have the function to perform the communication link with a wireless tag. Moreover, although the interrogator 2 of the conventional RFID system has the function to perform the communication link with the wireless tag 3, it does not have an active bidirectional radio function like a portable telephone, for example.

[0009] Moreover, in the picking system using the conventional RFID system, since bidirectional radio communication equipments, such as wireless LAN, and the interrogator of a RFID system are isolated systems in which both have a source of transmission, equipment becomes large and cost starts.

[0010] From now on, improvement in the speed of mobile radio, such as a portable telephone and Bluetooth, is interlocked with, and the activity of the RFID system in delivery business, mail delivery business, etc. becomes very effective. For this reason, it sets especially to use in a mobile environment, equipment is simplified and miniaturized, and a radio communication equipment which can utilize a RFID system is desired by the low price. Furthermore, a radio communication equipment with which the bidirectional radio function in which a broader-based communication link is also possible, and the function of the interrogator of a RFID system were united is desired.

[0011] The purpose of this invention is offering the radio communication equipment with which full-scale bidirectional radio communication equipments', such as an interrogator's, wireless LAN's, a cellular phone's, etc. in a RFID system, were united with the easy configuration, and the radio communications system using this radio communication equipment.

[0012] Moreover, other purposes of this invention are offering the radio communication equipment and radio communications system which perform the communication link with a wireless tag using the sending signal to other radio communication equipments.

[0013]

[Means for Solving the Problem] A bidirectional radio means for this invention to modulate the subcarrier sent from the source of transmission, to transmit to other radio communication equipments from an antenna, to receive the signal from other radio communication equipments with an antenna, and to get over. A signal is transmitted for the subcarrier sent from the source of transmission to a wireless tag from an antenna in a modulation or no becoming irregular. It is the radio communication equipment characterized by having the question means which reads the information which receives the signal which answers this signal, becomes irregular based on the information memorized, and is transmitted from a wireless tag with an antenna, gets over, and is memorized by the wireless tag.

[0014] If this invention is followed, a bidirectional radio means can perform the communication link with other radio communication equipments, and a question means can perform the communication link with a wireless tag. Therefore, it is not necessary to use for the communication link with other radio communication equipments and a wireless tag like before two equipments which became independent according to the individual.

[0015] Moreover, this invention is characterized by the source of transmission which sends the subcarrier of said bidirectional radio means and the source of transmission which sends the subcarrier of a question means being common.

[0016] If this invention is followed, since the source of transmission of a bidirectional radio means and the source of transmission of an interrogator will be communalized and the communication link with other radio communication equipments and the communication link with a wireless tag will be performed using the subcarrier made to send from one source of transmission, simplification and a miniaturization of equipment can be attained and reduction of a manufacturing cost can be aimed at.

[0017] Moreover, this invention is characterized by the antenna of said bidirectional radio means and the antenna of said question means being common.

[0018] If this invention is followed, one antenna will perform the communication link with other radio communication equipments and a wireless tag. Therefore, simplification and a miniaturization of equipment can be attained and reduction of a manufacturing cost can be aimed at.

[0019] Moreover, as for the antenna of said bidirectional radio means, and the antenna of said question means, this invention is characterized by being prepared separately, respectively.

[0020] If this invention is followed, since it will have two antennas of the antenna which performs bidirectional radio with other radio communication equipments, and

the antenna which performs the communication link with a wireless tag, each communication link can be performed using the antenna which fitted the communication link with other radio communication equipments and a wireless tag, respectively.

[0021] Moreover, this invention is characterized by the antenna of said bidirectional radio means and the antenna transmitted to the wireless tag of said question means being common.

[0022] When transmitting a signal to this invention \*\*\*\*\* and a wireless tag, the antenna of a bidirectional radio means to perform a wide area communication link can be used, and while it comes out to attain simplification and a miniaturization of equipment, the communication link range of a wireless tag becomes large. Moreover, while performing the communication link to other radio communication equipments, an electric wave can be effectively used by transmitting a wireless tag signal using the sending signal.

[0023] Moreover, this invention is characterized by becoming irregular with the modulation means by which the modulation of the subcarrier of said bidirectional radio means and the modulation of the subcarrier of said question means are common.

[0024] If this invention is followed, the signal transmitted to the signal and wireless tag which are transmitted to other radio communication equipments will be modulated with a common modulator. Therefore, simplification and a miniaturization of equipment can be attained.

[0025] Moreover, this invention is characterized by getting over with the recovery means by which the recovery of the signal transmitted from other radio communication equipments and the recovery of the signal transmitted from a wireless tag are common.

[0026] If this invention is followed, it will restore to the signal received from the reception carried out from other radio communication equipments, and a wireless tag with a common demodulator. Therefore, simplification and a miniaturization of equipment can be attained.

[0027] Moreover, the source of transmission where, as for said bidirectional radio means, this invention sends a subcarrier, A modulation means to modulate the subcarrier sent in said source of transmission, and the bidirectional wireless transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication equipments, It has a recovery means to restore to the signal received from other radio communication equipments. Said question means The wireless tag

transmitting antenna which transmits a signal to a wireless tag using the subcarrier sent in the source of transmission of said bidirectional radio means. It is characterized by having the wireless tag receiving antenna which receives the signal transmitted from a wireless tag, and a wireless tag recovery means to restore to the signal received with the wireless tag receiving antenna.

[0028] If this invention is followed, a question means will transmit a signal to a wireless tag using the subcarrier sent in the source of transmission of a bidirectional radio means. Therefore, bidirectional radio and the communication link with a wireless tag can be performed only by equipping a bidirectional radio means with a wireless tag transmitting antenna and a wireless tag receiving antenna, and a wireless tag recovery means. Therefore, simplification and a miniaturization of equipment can be attained.

[0029] Moreover, the source of transmission where, as for said bidirectional radio means, this invention sends a subcarrier, A modulation means to modulate the subcarrier sent in said source of transmission, and the bidirectional wireless transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication equipments, It has a recovery means to restore to the signal received from other radio communication equipments. Said question means The wireless tag

transmitting antenna which transmits a signal to a wireless tag using the subcarrier sent in the source of transmission of said bidirectional radio means, It has the wireless tag receiving antenna which receives the signal transmitted from a wireless tag, and is characterized by restoring to the signal transmitted from a wireless tag with the recovery means of said bidirectional radio means.

[0030] If this invention is followed, a question means will restore to the signal which transmits a signal to a wireless tag using the subcarrier sent with a bidirectional radio means, and is transmitted from a wireless tag with the demodulator of a bidirectional radio means. Bidirectional radio and the communication link with a wireless tag can be performed only by equipping a bidirectional radio means with a wireless tag transmitting antenna and a wireless tag receiving antenna by offering the multifunctional demodulator with which a bidirectional radio means can restore also to the signal transmitted from a wireless tag. Therefore, simplification and a miniaturization of equipment can be attained.

[0031] Moreover, this invention is characterized by having the signal coupler which combines alternatively with a demodulator the signal transmitted from the signal or wireless tag transmitted from other radio communication equipments.

[0032] If this invention is followed, since the signal transmitted by the signal coupler

from other radio communication equipments and the signal transmitted from a wireless tag will be alternatively combined with a demodulator, said two signals are not inputted into one demodulator at coincidence. Therefore, it is possible to restore to said two signals with one demodulator.

[0033] Moreover, this invention is characterized by the bidirectional wireless transceiver antenna of said bidirectional radio means and the wireless tag transmitting antenna of a question means being common antennas.

[0034] If this invention is followed, since the same antenna as the communication link with other radio communication equipments and transmission of the signal to a wireless tag will be used, simplification and a miniaturization of equipment can be attained. When transmitting a signal to a wireless tag, the antenna of a bidirectional radio means to perform a wide area communication link can be used, and the communication link range of a wireless tag becomes large.

[0035] Moreover, this invention is characterized by having the signal eliminator which sends the signal transmitted from the wireless tag which received the signal from the source of transmission with delivery and an antenna at the antenna to a recovery means to restore to this signal.

[0036] If this invention is followed, since the signal to a wireless tag to transmit and the signal received from a wireless tag are separable with a signal eliminator, the signal from transmission and the wireless tag of a signal is receivable to a wireless tag with the same antenna.

[0037] Moreover, this invention is characterized by forming the transmission-and-reception eliminator which separates the sending signal to other radio communication equipments, and the input signal from other radio communication equipments.

[0038] If this invention is followed, since it will have transmission-and-reception eliminators, such as a diplexer and a switch, for example, a TDD (Time Division Duplex) method and a FDD (Frequency Division Duplex) method can perform bidirectional radio with other radio communication equipments.

[0039] Moreover, this invention is characterized by restoring to the signal transmitted from a wireless tag using a part of subcarrier sent in the source of transmission.

[0040] If this invention is followed, since it will restore to the signal which takes out a part of subcarrier sent in the source of transmission, for example using the signal distribution box etc., and is transmitted from a wireless tag using this subcarrier, a synchronous detection can be performed even if it does not independently make the source of dispatch for a synchronous detection.

[0041] Moreover, said source of transmission is established for this invention in a bidirectional radio means, and said bidirectional radio means is characterized by having the antenna which transmits a signal to a wireless tag.

[0042] If this invention is followed, a bidirectional radio means has a source of transmission, and even if a question means does not have a source of transmission, it can receive the information on a wireless tag by carrying out wireless tag transmission of the signal sent from the source of transmission of said bidirectional radio means from an antenna. Furthermore, transmission of the signal to a wireless tag and transmission, such as data to other radio communication equipments, can be operated to coincidence with one sending-signal energy.

[0043] Moreover, this invention is characterized by being carried out by the antenna with common transmission and reception of the signal to other radio communication equipments which a bidirectional radio means performs and transmission of the signal to a wireless tag.

[0044] If this invention is followed, since the communication link with other radio means of a bidirectional radio means and the signal to a wireless tag will be transmitted with the same antenna, simplification and a miniaturization of equipment can be attained.

[0045] Moreover, this invention is characterized by being carried out by the antenna with separate transmission and reception of the signal to other radio communication equipments which a bidirectional radio means performs and transmission of the signal to a wireless tag.

[0046] If this invention is followed, since an antenna with separate transmission and reception of the signal to other radio communication equipments and reception of the signal to a wireless tag will perform, the antenna suitable for a communication link can be used for each.

[0047] Moreover, this invention is characterized by equipping a question means with the antenna which receives the signal transmitted from the signal and bidirectional radio means which were modulated based on information with the wireless tag.

[0048] If this invention is followed, since the same antenna will receive the signal from a wireless tag, and the signal from a bidirectional radio means and it will restore to a signal, simplification and a miniaturization of equipment can be attained.

[0049] Moreover, this invention is characterized by equipping a question means with the antenna which receives the signal modulated based on information with the wireless tag, and the antenna which receives the signal transmitted from the bidirectional radio means separately.

[0050] If this invention is followed, since a question means receives the signal from a wireless tag, and the signal from a bidirectional radio means with a separate antenna, using the antenna suitable for reception of each signal, it can receive a signal and it can be restored to it.

[0051] Moreover, the source of transmission where, as for said bidirectional radio means, this invention sends a subcarrier, A modulation means to modulate the subcarrier sent in said source of transmission, and the bidirectional transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication equipments, It has a recovery means to restore to the signal received from other radio communication equipments. Said question means It is characterized by having the recovery means which carries out the mixed recovery of the signal received with the bidirectional wireless receiving antenna which receives the signal transmitted from the bidirectional transceiver antenna of said bidirectional radio means, the wireless tag receiving antennas which receive the signal transmitted from a wireless tag, and these antennas.

[0052] If this invention follows, since the recovery means of the signal which receives the signal transmitted from the antenna of a bidirectional radio means with a bidirectional wireless receiving antenna, receives the signal transmitted from a wireless tag with a wireless tag receiving antenna, and is transmitted from a bidirectional radio means, and the signal which are transmitted from a wireless tag will mix and carry out, even if a question means is not equipped with the source of transmission, it can perform the synchronous detection of the signal transmitted from a wireless tag

[0053] Moreover, this invention is characterized by the bidirectional wireless receiving antenna and wireless tag receiving antenna of said question means being common.

[0054] If this invention is followed, since the same antenna will receive the signal transmitted from the bidirectional radio means of a question means, and the signal transmitted from a wireless tag, simplification and a miniaturization of equipment can be attained.

[0055] Moreover, this invention is a radio communications system characterized by consisting of said radio communication equipment and a wireless tag.

[0056] If this invention is followed, since the radio communications system which consists of said radio communication equipment and wireless tag can be constituted, information can be immediately transmitted to the management equipment which manages the information on a wireless tag for the information received from the

wireless tag with the question means with a bidirectional radio means, for example. Moreover, since a radio communication equipment performs the communication link with other radio communication equipments and a wireless tag by wireless, it does not have constraint of installation etc.

[0057] Moreover, it is characterized by the ability of a radio communication equipment for this invention to write information in said wireless tag, and write information in a wireless tag on radio.

[0058] If this invention is followed, information can be written in a wireless tag with said radio communication equipment. Information can be transmitted to a radio communication equipment from the management equipment which follows, for example, manages the information on a wireless tag, information can be transmitted to a wireless tag from a radio communication equipment, the information on a wireless tag can be written in, and a wireless tag can be managed exactly.

[0059]

[Embodiment of the Invention] Drawing 1 is drawing showing the radio structure of a system containing the radio communication equipments 4 which is one gestalt of operation of this invention. The radio communications system shown in drawing 1 consists of other radio communication equipments 19 with which the wireless tag 3 and radio communication equipment 4 other than a radio communication equipment 4 perform bidirectional radio. In addition, since the wireless tag 3 and other radio communication equipments 19 which are shown in drawing 1 are the same as the wireless tag 3 and other radio communication equipments 19 which were shown in drawing 14 and drawing 15, they attach the same sign and omit the explanation. Moreover, the radio communications system of each operation gestalt of not only this operation gestalt but this invention is constituted including said wireless tag 3 and other radio communication equipments 19. The wireless tag 3 can write information in memory by wireless.

[0060] A radio communication equipment 4 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio

communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone. A radio communication equipment 4 transmits a signal to the source 40 of transmission, a signal distribution box 41, a modulator 42, the transmitting RF section 43, the signal eliminator 44, the transmission-and-reception eliminator 45, and other radio communication equipments



19. The bidirectional wireless transceiver antenna which receives a signal from other radio communication equipments 19. The wireless tag transmitting antenna which transmits a signal to the wireless tag 3. As a wireless tag receiving antenna which receives the signal transmitted from the wireless tag 3 it is constituted including the functioning bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, the receiving RF section 47, a demodulator 48, the wireless tag demodulator 49, the information signal input section 50, the recovery signal output part 51, and the tag recovery signal output part 52.

[0061] The bidirectional radio means of a radio communication equipment 4 A subcarrier The subcarrier sent in the source 40 of transmission which sends, and the source 40 of transmission The transmission-and-reception eliminator 45, the bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46 which separate the signal transmitted from the transmitting RF section 43 which consists of the modulator 42 and filter which are a modulation means to become irregular, amplifier, etc., the signal transmitted to other radio communication equipments 19, and other radio communication equipments 19. The information to which it restored with the information signal input section 50 which inputs the information for modulating a subcarrier with the receiving RF section 47 which consists of a filter, amplifier, etc., the demodulator 48 which is a recovery means to restore to the signal transmitted from other radio communication equipments 19, and a modulator 42, and a demodulator 48 It is constituted including the outputting recovery signal output part 51.

[0062] The question means of a radio communication equipment 4 consists of the transmitting RF section 43 and circulator which consist of a signal distribution box 41 which takes out the subcarrier sent in the source 40 of transmission which sends a subcarrier, and the source 40 of transmission, a modulator 42 which modulates the subcarrier sent in the source 40 of transmission, a filter, amplifier, etc., a coupler, etc. The signal transmitted to the wireless tag 3, and the signal transmitted from the wireless tag 3 With the wireless tag demodulator 49 and modulator 42 which are a wireless tag recovery means to restore to the signal transmitted from the receiving RF section 47 which consists of the signal eliminator 44 to separate, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transceiver common antenna 46, a filter, amplifier, etc., and the wireless tag 3, a subcarrier It is constituted including the information signal input section 50 which inputs the information for becoming irregular, and the tag recovery signal output part 52 which outputs the signal to which it restored with the

wireless tag demodulator 48.

[0063] With the bidirectional radio means and question means which were mentioned above, although the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transceiver common antenna 46, and the information signal input section 50 are share-sized as radical headquarters, a modulator 42, the information signal input section 50, and transmitting RF section 43 grade may divide according to the signal aspect which communicates.

[0064] When performing the FURIKEN C hopping which communicates while it may be fixed and a frequency is changed, the frequency of the subcarrier sent in the source 40 of transmission of a radio communication equipment 4 may be constituted so that it may have the frequency adjustable function to change the frequency which sends in the source 40 of transmission. Moreover, in drawing 1, when a switch is used for the transmission-and-reception eliminator 45, the signal-processing section which processes the signal outputted from the signal-processing section, the recovery signal output part 51, and the tag recovery signal output part 52 which process the signal inputted into the control section for changing this switch and the information signal input section 50 is omitting.

[0065] Next, actuation of a radio communication equipment 4 is explained. First, the case where bidirectional radio with other radio communication equipments 19 is performed is explained. When performing the communication link with other radio communication equipments 19, the bidirectional radio means mentioned above is used. When transmitting a signal to other radio communication equipments 19, the subcarrier sent in the source 40 of transmission is modulated with a modulator 42 based on the information inputted from the information signal input section 50. The modulating signal modulated with the modulator 42 is transmitted via the transmitting RF section 43, the signal eliminator 44, and the transmission-and-reception eliminator 45 from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46. This signal is sent to other corresponding radio communication equipments 19. With this operation gestalt, a switch is used for the transmission-and-reception eliminator 45 as using a TDD (Time Division Duplex) communication link for the communication link with other radio communication equipments 19. On the other hand, when receiving the signal transmitted from other radio communication equipments 19, it is received by bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and the signal transmitted from other radio communication equipments 19 passes along

the receiving RF section 47 via the transmission-and-reception eliminator (switch) 45 switched to the reception RF 47 side, and restores to it with a demodulator 48. The information signal to which it restored with the demodulator 48 is taken out from the recovery signal output part 51.

[0066] Next, the case (RFID actuation is called hereafter) where a radio communication equipment 4 is operated as an interrogator of a RFID system is explained. When performing the communication link with the wireless tag 3, the question means mentioned above is used. First, the subcarrier sent in the source 40 of transmission is sent out to the wireless tag 3 through a modulator 42, the transmitting RF section 43, the signal eliminator 44, and the transmission-and-reception eliminator 45 from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46. Although the modulator 42 used by the communication link with other radio communication equipments 19 is performing the modulation in the communication link with the wireless tag 3 with this operation gestalt, when a difference is in the communication mode of other radio communication equipments 19 and the wireless tag 3, the more nearly optimal modulator may be formed independently. Moreover, the transmitting RF section 43 may also be divided into the optimal gestalt. In forming separately the modulator which performs the communication link with the modulator and the wireless tag 3 which are used for the communication link with other radio communication equipments 19, the two information signal input sections 50 are formed, and it inputs an information signal into each modulator.

[0067] When reading the information currently written in the wireless tag 3, the subcarrier sent in the source 40 of transmission is modulated for the read-out command information for reading the information on the wireless tag 3 with no becoming irregular or a modulator 42. It is transmitted from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and this signal is received by the wireless tag 3. With the wireless tag 3, after receiving the signal transmitted from a radio communication equipment 4, it becomes irregular and transmits by the are recording information which this wireless tag 3 has. It is received by bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and the signal transmitted from the wireless tag 3 is separated by the transmission-and-reception eliminator 45. In RFID actuation, it is fixed to the signal eliminator 44, i.e., transmitting system with modulator 42, side, and the switch which is the transmission-and-reception eliminator 8 is performed in the state of the switch in the time of transmission of \*\* or the bidirectional radio mentioned above. It

is also possible to perform RFID actuation by this configuration at the time of transmission to other radio communication equipments 19.

[0068] The signal turned up and transmitted from the wireless tag 3 is sent to the wireless tag demodulator 49, after being separated by the signal eliminator 44. The wireless tag demodulator 49 is a demodulator of the synchronous-detection mold which restores to the signal which inputs a part of subcarrier from the source 40 of transmission taken out by the signal distribution box 41, and is transmitted from the wireless tag 3. Moreover, what arranges and took out the signal distribution box 41 to the output side of a modulator 42 may be used for the signal used for a synchronous detection with the wireless tag demodulator 49. Moreover, although the wireless tag demodulator 49 of this operation gestalt is a demodulator of a synchronous-detection mold, the wireless tag demodulator 49 may be an independent demodulator. The signal to which it restored in the wireless tag recovery section 49 is taken out from the tag recovery signal output part 52.

[0069] As mentioned above, in the radio communication equipment 4 of this operation gestalt, the source 40 of transmission, the transmission-and-reception eliminator 45, and bidirectional wireless transmission and reception and wireless tag transceiver common antenna 46 grade are share-sized with a question means to perform the communication link with the bidirectional radio means and the wireless tag 3 which perform the communication link with other radio communication equipments 19. Thus, by using each part in common, simplification and a miniaturization of equipment can be attained and a manufacturing cost is also held down. Moreover, what is necessary is just to use a diplexer as a transmission-and-reception eliminator in the wireless radios 4 of this operation gestalt, as what performs a TDD (Time Division Duplex) communication link, in performing a FDD communication link although the transmission-and-reception eliminator 45 was considered as the switch. Moreover, when for example, a bidirectional radio means is used as the base and it constitutes a radio communication equipment 4, it becomes possible to perform not only the communication link with other radio communication equipments 19 but the communication link with the wireless tag 3 with the easy configuration which equips this bidirectional radio means with the signal eliminator 44, the wireless tag demodulator 49, and the tag recovery signal output part 52.

[0070] Drawing 2 is drawing showing the radio structure of a system containing the radio communication equipment 5 which are other operation gestalten of this invention. With the radio communication equipment 5 shown in drawing 2, the same sign is given to the part which overlaps the radio communication equipment 4 of said

operation gestalt shown in drawing 1 , and the explanation is omitted. Although a radio communication equipment 5 is the almost same configuration as the radio communication equipment 4 of said operation gestalt and is not equipped with a signal eliminator, it is equipped with the wireless tag receiving antenna 53 which receives the signal further transmitted from the wireless tag 3.

[0071] A radio communication equipment 5 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0072] The bidirectional wireless transceiver antenna which the bidirectional radio means of a radio communication equipment 5 transmits a signal to the source 40 of transmission, a modulator 42, the transmitting RF section 43, the wireless transmission-and-reception eliminator 45, and other radio communication equipments 19, and receives a signal from other radio communication equipments 19. It is constituted including the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 which functions as a wireless tag transmitting antenna which transmits a signal to the wireless tag 3, the receiving RF section 47, a demodulator 48, the information signal input section 50, and the recovery signal output part 51. Moreover, the question means of the radio means 5 is constituted including the source 40 of transmission, a signal distribution box 41, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76, the wireless tag receiving antenna 53 that receives the signal transmitted from the wireless tag 3, the wireless tag demodulator 49, the information signal input section 50, and the tag recovery signal output part 52.

[0073] In the radio communication equipment 5, the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76, and the information signal input section 50 are share-sized in a bidirectional radio means and a question means. A modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45 as well as the radio communication equipment 4 of drawing 1 , etc. may be divided by the communication mode of a both-hands stage. Thus, by using each part in common, simplification and a miniaturization of equipment can be attained and a manufacturing

cost is also held down.

[0074] Since communication link actuation with other radio communication equipments 19 is the same as that of the radio communication equipment 4 of said operation gestalt in a radio communication equipment 5, explanation is omitted.

[0075] RFID actuation of a radio communication equipment 5 is explained below. The question means mentioned above is used for the communication link with the wireless tag 3. The subcarrier sent in the source 40 of transmission is sent out through a modulator 42, the transmitting RF section 43, and the transmission-and-reception eliminator 45 from bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76. When reading the information currently written in the wireless tag 3, the subcarrier sent in the source 40 of transmission is modulated for the read-out command information for reading the information on the wireless tag 3 with no becoming irregular or a modulator 42. It is transmitted from the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 which has a role of a wireless tag transmitting antenna, and this signal is received by the wireless tag 3. With the wireless tag 3, after receiving the signal transmitted from a radio communication equipment 5, it becomes irregular and sends out by the are recording information which this wireless tag 3 has. It is received by the wireless tag receiving antenna 53, and the signal transmitted from the wireless tag 3 is sent to the wireless tag recovery section 49. The wireless tag recovery section 49 inputs a part of subcarrier from the source 40 of transmission taken out by the signal distribution box 41, and restores to the signal received from the wireless tag 3.

[0076] As mentioned above, a radio communication equipment 5 is equipped with the wireless tag receiving antenna 53 which receives the signal from the wireless tag 3 other than bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76. The sending signal to the wireless tag 3 can perform the communication link with the wireless tag 3 more efficiently by transmitting using the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 which performs a communication link wide range than the communication link with other radio communication equipments, i.e., the communication link with the wireless tag 3, and receiving the signal from the wireless tag 3 using the directive high wireless tag receiving antenna 53.

[0077] Drawing 3 (a) is drawing showing the radio structure of a system containing the radio communication equipment 6 of the operation gestalt of further others of this invention. With the radio communication equipment 6 shown in drawing 3 (a), the same sign is given to the part which overlaps the radio communication equipment 4 of said

operation gestalt or radio communication equipment 5 shown in drawing 1 or drawing 2, and the explanation is omitted. The radio communication equipment 6 of this operation gestalt is the almost same configuration as the radio communication equipment 4 of said operation gestalt, and is equipped with the antenna transfer switch 55 which switches the bidirectional wireless transceiver antenna 86 and the wireless tag transceiver antenna 54 by the communication link with the wireless tag transceiver antenna 54 which receives the signal from sending out and the wireless tag 3 for a signal to the wireless tag 3, and other radio communication equipments 19 or the wireless tag 3.

[0078] A radio communication equipment 6 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0079] The bidirectional radio means of a radio communication equipment 6 transmits a signal to the source 40 of transmission, a modulator 42, the transmitting RF section 43, the antenna changeover switch 55, the transmission-and-reception eliminator 45, and other radio communication equipments 19, and consists of other radio communication equipments 19 including the bidirectional wireless transceiver antenna 86 and the receiving RF section 47 which receive a signal, the recovery section 48, the information signal input section 50, and the recovery signal output part 51.

Moreover, the question means of a radio communication equipment 6 is constituted including the wireless tag transceiver antenna 54 which has the function of a wireless tag receiving antenna receive the signal transmitted from the wireless tag transmitting antenna and the wireless tag 3 which transmit a signal to the source 40 of transmission, a signal distribution box 41, a modulator 42, the transmitting RF section 43, the signal eliminator 44, the antenna changeover switch 55, and the wireless tag 3, the wireless tag demodulator 49, the information signal input section 50, and the tag recovery signal output part 52.

[0080] With the bidirectional radio means and question means which were mentioned above, the source 40 of transmission, the antenna changeover switch 55, etc. are share-sized further. Thus, with a bidirectional radio means and a question means, by using each part in common, simplification and a miniaturization of equipment can be attained and reduction of a manufacturing cost can be aimed at.

[0081] Communication link actuation with other radio communication equipments 19

of a radio communication equipment 6 is in the condition which switched the antenna transfer switch 55 to the bidirectional wireless transceiver antenna 86 side, and since it is carried out like the radio communication equipment 4 of said operation gestalt, it omits explanation.

[0082] RFID actuation of a radio communication equipment 6 is explained below. The question means mentioned above is used for the communication link with the wireless tag 3. The subcarrier sent in the source 40 of transmission passes along the antenna transfer switch 55 switched to the modulator 42, transmitting RF section 43, signal eliminator 44, and wireless tag transceiver antenna 54 side, and is transmitted from the wireless tag transceiver antenna 54. When reading the information currently written in the wireless tag 3, the subcarrier sent in the source 40 of transmission is modulated in inputting the read-out command information for reading the information on the wireless tag 3 with no becoming irregular or a modulator 42 from the information input section 50. It passes along the antenna changeover switch 55, and is transmitted from the wireless tag transceiver antenna 54, and the signal outputted from a modulator 42 is received by the wireless tag 3. With the wireless tag 3, after receiving the signal transmitted from a radio communication equipment 6, it becomes irregular and sends out by the are recording information which this wireless tag 3 has. It is received by the wireless tag transceiver antenna 54, and the signal sent out from the wireless tag 3 passes along the antenna transfer switch 55 and the signal eliminator 44, and is sent to the wireless tag recovery section 49. The wireless tag recovery section 49 inputs a part of subcarrier from the source 40 of transmission taken out by the signal distribution box 41, and restores to the signal received from the wireless tag 3.

[0083] As mentioned above, a radio communication equipment 6 is equipped with a signal with the wireless tag transceiver antenna 54 which receives the signal from sending out and the wireless tag 3 to the bidirectional wireless transceiver antenna 86 which performs the communication link with other radio communication equipments 19, and the wireless tag 3, by the communication link with other radio communication equipments 19, or the communication link with the wireless tag 3, switches the antenna transfer switch 55 and is considering it as the configuration which uses the bidirectional wireless transceiver antenna 86 and the wireless tag transceiver antenna 54 properly. Therefore, the description of each communication link can be effectively demonstrated by using a separate antenna for the communication link with the communication link with other radio communication equipments 19, and the wireless tag 3.

[0084] In addition, as shown in the local Fig. of drawing 3 (b), in a radio communication equipment 6, the antenna changeover switch 55 and the wireless tag transceiver antenna 86 may be placed between the bidirectional wireless transceiver antenna 86 and the transmission-and-reception part device 45. By this, a radio communication equipment 6 can also perform the communication link with the wireless tag 3, while transmitting to other radio communication equipments 19 depending on communication environment.

[0085] Drawing 4 is drawing showing the radio structure of a system containing the radio communication equipment 7 of the operation gestalt of further others of this invention. With the radio communication equipment 7 shown in drawing 4, the same sign is given to the part which overlaps the radio communication equipment 4 of said operation gestalt shown in drawing 1, and the explanation is omitted.

[0086] Although the separate demodulator was used for the communication link with other radio communication equipments 19, and the communication link with the wireless tag 3 in the radio communication equipments 4, 5, and 6 of said operation gestalt, the radio communication equipment 7 of this operation gestalt restores to the signal received in the communication link with other radio communication equipments 19 and the wireless tag 3 with one recovery means (multifunctional demodulator 57).

Usually, in two-way communication with other radio communication equipments 19, modulation techniques, such as PSK (Pulse Sift Keying) and QPSK (Quadrature Phase Sift Keying), are often used. On the other hand, in the communication link of RFID actuation, modulation techniques, such as simple ASK (Amplitude Sift Keying) or simple PSK, are used. Therefore, as a multifunctional demodulator 57, if the demodulator of PSK, a QPSK synchronous-detection method, or a delay detection system is used, it can be made to serve a double purpose to both communication links.

[0087] A radio communication equipment 7 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0088] The bidirectional radio means of a radio communication equipment 7 is constituted including the signal coupler 56 which combines alternatively with the multifunctional demodulator 57 the signal transmitted from the signal or the wireless tag 3 transmitted from the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless

transmission and reception and a wireless tag transceiver common antenna 46, and other radio communication equipments 19, the receiving RF section 47, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51. Moreover, the question means of a radio communication equipment 7 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the signal eliminator 44, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transceiver common antenna 46, the signal coupler 56, the receiving RF section 47, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51.

[0089] Since it is carried out like the radio communication equipment 4 of said operation gestalt in a radio communication equipment 7 where the switch which is the signal coupler 56 is connected to the transmission-and-reception eliminator 45 by the communication mode in communication link actuation with other radio communication equipments 19, explanation is omitted. In addition, as the local Fig. of drawing 3 (b) showed, an antenna changeover switch and a wireless tag transceiver antenna may be placed between bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and the transmission-and-reception eliminator 45.

[0090] Below, RFID actuation of a communication terminal 7 is explained. When performing the communication link with the wireless tag 3, the question means mentioned above is used. The subcarrier sent in the source 40 of transmission is transmitted through a modulator 42, the transmitting RF section 43, the signal eliminator 44, and the transmission-and-reception eliminator 45 from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46. When reading the information currently written in the wireless tag 3, the subcarrier sent in the source 40 of transmission is modulated for the read-out command information for reading the information on the wireless tag 3 with no becoming irregular or a modulator 42. It is transmitted from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and this signal is received by the wireless tag 3. With the wireless tag 3, after receiving the signal transmitted from a radio communication equipment 7, it becomes irregular and sends out by the are recording information which this wireless tag 3 has. It is received by bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and the signal sent out from the wireless tag 3 is sent to the signal eliminator 44. It is separated by the signal eliminator 44, and the signal received from the wireless tag 3 passes along the signal coupler 56 and the receiving RF

section 47, and restores to them with the multifunctional demodulator 57. In a radio communication equipment 7, although RF switch is used as a signal coupler 56, a circulator, a coupler, etc. may be used. Moreover, the switch which is the transceiver eliminator 45 is fixed to a transmitting system side in RFID actuation. The signal to which it restored with the multifunctional demodulator 57 is taken out from the recovery signal output part 51, and the are recording information on the wireless tag 3 is acquired.

[0091] As mentioned above, the source 40 of transmission, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transceiver common antenna 46, the signal coupler 56, and multifunctional demodulator 57 grade are communalized and used for the bidirectional radio means and question means of a radio communication equipment 7 as radical headquarters. Therefore, simplification and a miniaturization of equipment can be attained and reduction of a manufacturing cost can be aimed at.

[0092] Moreover, it is good also as a multifunctional demodulator 58 which used the synchronous-detection method of a carrier playback mold for the multifunctional demodulator 57 of the radio communication equipment 7 of said operation gestalt with the operation gestalt of further others of this invention. Drawing 5 is drawing showing the configuration of the radio communication equipment 8 of this operation gestalt. With the radio communication equipment 8 shown in drawing 5, the same sign is given to the part which overlaps the radio communication equipments 4 and 7 of said operation gestalt shown in drawing 1 and drawing 4, and the explanation is omitted.

[0093] A radio communication equipment 8 restores to the signal received in the communication link with other radio communication equipments 19 and the wireless tag 3 with the multifunctional demodulator 58 using the synchronous-detection method of a carrier playback mold. Various approaches, such as an approach of making the dispatch wave which carried out phase simulation to the signal which formed the transmitter in the demodulator and was received by the PLL (PhaseLocked Loop) circuit as a demodulator of a synchronous-detection method, and performing a synchronous detection, and a method using the Costas loop formation, are used. Moreover, when using as an interrogator, the source 40 of transmission is used as a carrier for synchronous detections. In a radio communication equipment 8, the subcarrier from the source 40 of transmission is taken out by the signal distribution box 41, and this signal is \*(ed) to the multifunctional demodulator 58 of a synchronous-detection mold through the source switch 59 of a signal. The signal led to the multifunctional demodulator 58 is used as a

carrier for synchronous detections.

[0094] It is good also as a configuration which sends the signal which receives the signal transmitted from the wireless tag 3 without considering as the configuration which sends the signal received from the wireless tag 3 with the operation gestalt of further others of this invention using the signal eliminator 44 like the radio communication equipment 7 of said operation gestalt to the signal coupler 56, which was equipped with wireless tag receiving-antenna 53, and which was received with this wireless tag receiving antenna 53 to the signal coupler 56. Drawing 6 is drawing showing the radio structure of a system containing the radio communication equipment 9 of this operation gestalt, with the radio communication equipment 9 shown in drawing 6, the same sign is given to the part which overlaps drawing 2, drawing 4, and the radio communication equipments 5 and 7 of said operation gestalt boiled and shown, and the explanation is omitted.

[0095] A radio communication equipment 9 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0096] The bidirectional radio means of a radio communication equipment 9 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76, the signal coupler 56, the receiving RF section 47, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51. Moreover, the question means of a radio communication equipment 9 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transceiver separation section 45, the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 that function on the wireless tag 3 as wireless tag transmitting antennas which transmit a signal, the wireless tag receiving antenna 53, the signal coupler 56, the receiving RF section 56, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51.

[0097] As radical headquarters, the bidirectional radio means and question means of a radio communication equipment 9 share-ize the source 40 of transmission, the transmission-and-reception eliminator 45, bidirectional wireless transmission and

reception and a wireless tag transmitting common antenna 76, the signal coupler 56, and multifunctional demodulator 57 grade, and they are used for them.

[0098] Since a radio communication equipment 9 is equipped with the wireless tag receiving antenna 53 which receives the signal transmitted from the wireless tag 3, the sending signal to the wireless tag 3 transmits using the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 which performs a communication link wide range than the communication link with other radio communication equipments, i.e., the communication link with the wireless tag 3, and receives the signal from the wireless tag 3 using the directive high wireless tag receiving antenna 53. Thus, the feebleer signal from the wireless tag 3 is receivable by using the directive high wireless tag receiving antenna 53.

[0099] RFID actuation of a radio communication equipment 9 uses the question means mentioned above. The subcarrier sent in the source 40 of transmission is sent out through the transmitting RF section 43, the transmission-and-reception eliminator 45, and bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76 in no becoming irregular thru/or the condition of having become irregular in part, and results in the wireless tag 3. It is received by the wireless tag receiving antenna 53, and through the signal coupler 56, the signal returned from the wireless tag 3 goes into the multifunctional demodulator 57, it restores to it, and the information on the wireless tag 3 is taken out from the recovery signal output part 51. Although a part of signal returned from the wireless tag 3 is inputted into bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76, this does not become a problem by devising [ configuration / of the transmitting RF section 43 ]. Communication link actuation with other radio communication equipments 19 does not involve, but since it is the same as that of the radio communication equipment 7 of drawing 4, especially the wireless tag receiving antenna 53 omits explanation.

[0100] As mentioned above, by using a common part with a bidirectional radio means and a question means, simplification and a miniaturization of equipment can be attained and a manufacturing cost can be reduced.

[0101] It is good also as a multifunctional demodulator 58 which used the synchronous-detection method of a carrier playback mold for the multifunctional demodulator 57 of the radio communication equipment 9 of said operation gestalt with the operation gestalt of further others of this invention. Drawing 7 is drawing showing the configuration of the radio communication equipment 10 of this operation gestalt. With the radio communication equipment 10 of this operation gestalt, the same sign is

given to the part which overlaps the radio communication equipments 8 and 9 of said operation gestalt shown in drawing 5 and drawing 6, and the explanation is omitted.

Moreover, since communication link actuation with other radio communication equipments and RFID actuation are the same as that of the radio communication equipment 7 of said operation gestalt fundamentally, the explanation is omitted.

[0102] Drawing 8 is drawing showing the radio structure of a system containing the radio communication equipment 11 of the operation gestalt of further others of this invention. With the radio communication equipment 11 of this operation gestalt, the same sign is given to the part which overlaps the radio communication equipment of said operation gestalt, and the explanation is omitted. A radio communication equipment 11 is the almost same configuration as the radio communication equipment 7 of said operation gestalt, and is equipped with the signal coupler 60 which switches the bidirectional wireless transceiver antenna 86 and the wireless tag transceiver antenna 54 to the wireless tag 3 by the communication link with the wireless tag transceiver antenna 54 which receives the signal to which a signal is transmitted from transmission and the wireless tag 3, and other radio communication equipments 19 and the wireless tag 3.

[0103] A radio communication equipment 11 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0104] The bidirectional radio means of a radio communication equipment 11 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the signal coupler 60, the transmission-and-reception eliminator 45, the bidirectional wireless transceiver antenna 86, the signal coupler 56, the receiving RF section 47, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51. Moreover, the question means of a radio communication equipment 11 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the signal coupler 60, the transmission-and-reception eliminator 44, the wireless tag transceiver antenna 54, the signal coupler 56, the receiving RF section 47, the multifunctional demodulator 57, the information input section 50, and the recovery signal output part 51.

[0105] The source 40 of transmission, the signal coupler 60, the signal coupler 56, the receiving RF section 47, and multifunctional demodulator 57 grade are communalized



and used for the bidirectional radio means and question means of a radio communication equipment 11 as radical headquarters. Simplification and a miniaturization of equipment can be attained by considering as such a configuration, and reduction of a manufacturing cost is possible.

[0106] When performing the communication link with other radio communication equipments, a radio communication equipment 11 connects to the transmission-and-reception eliminator 45 side RF switch which are the signal coupler 60 (this operation gestalt switch) and the signal coupler 56, and communicates using the bidirectional wireless transceiver antenna 86 of an above-mentioned bidirectional radio means. On the other hand, in RFID actuation, the signal coupler 60 and the signal coupler 56 are connected to the signal eliminator 44, and it is performed using an above-mentioned question means. The subcarrier from the source 40 of transmission is sent out from the wireless tag transceiver antenna 54 via a modulator 42, the transmitting RF section 43, the signal coupler 60, and the signal eliminator 44. It is received by the wireless tag transceiver antenna 54, it is separated by the signal eliminator 44, and restores to the signal from the wireless tag 3 with the multifunctional demodulator 57 via the signal coupler 56 and the receiving RF section 47. Thus, in the case of a communication link, it is switched and used for the antenna suitable for each communication link with other radio communication equipments or the wireless tag 3.

[0107] It is good also as a multifunctional demodulator which used the synchronous-detection method of a carrier playback mold for the multifunctional demodulator 57 of the radio communication equipment 11 of said operation gestalt with the operation gestalt of further others of this invention. Drawing 9 is drawing showing the configuration of the radio communication equipment 12 of this operation gestalt. With the radio communication equipment 12 of this operation gestalt, the same sign is given to the part which overlaps the radio communication equipment of said operation gestalt, and the explanation is omitted. The radio communication equipment 12 of this operation gestalt restores to the signal received in the communication link with other radio communication equipments and a wireless tag with the multifunctional demodulator 58 using the synchronous-detection method of a carrier playback mold. Since communication link actuation with other radio communication equipments and a wireless tag is fundamentally the same, it abbreviates explanation to the radio communication equipment 11 of said operation gestalt.

[0108] Drawing 10 is drawing showing the configuration of the communication system

containing the radio communication equipment 13 of the operation gestalt of further others of this invention. The radio communication equipment 13 of this operation gestalt is constituted including the question section 15 which is a question means to perform the communication link with the bidirectional Radio Communications Department 14 and the wireless tag which are the bidirectional radio means which communicates with other radio communication equipments 19.

[0109] Since the bidirectional Radio Communications Department 14 is the same configuration as the conventional bidirectional radio communication equipment 1 shown in drawing 14, it omits the explanation. The bidirectional Radio Communications Department 14 and the question section 15 can also constitute possible [desorption].

[0110] Drawing 11 is drawing showing the configuration of the question section 15 of a radio communication equipment 13. An interrogator 15 is constituted including the bidirectional wireless receiving antenna 62 which receives directly the signal sent out from the antenna of the bidirectional Radio Communications Department 14, the wireless tag receiving antenna 63 which receives the signal sent out from the wireless tag 3, a demodulator 64, the signal-processing section 65, and the recovery signal output part 66.

[0111] Next, RFID actuation of a radio communication equipment 13 is explained. The bidirectional Radio Communications Department 14 sends a signal from an antenna 24, in order to communicate. Although an antenna 24 is the same antenna as the conventional antenna 24 shown in drawing 14, it transmits the signal to transmission and reception of the signal of 19 with bidirectional radio equipment, transmission of the signal to a wireless tag, and the antenna 63 of a question means. The signal sent from the antenna 24 results also in the wireless tag 3 which exists in a certain distance, and is inputted also into the bidirectional wireless receiving antenna 62 of the question section 15 further arranged near an antenna 24 at near at the same time it is emitted towards other radio machines 19. That magnitude is adjusted by the directive design of the bidirectional wireless receiving antenna 62 although a part of this sending signal results also in the wireless tag receiving antenna 63 of the question section 15. For example, with this operation gestalt, the wireless tag receiving antenna 63 is made into a flat antenna with directivity, and is arranged on the side face of the question section 15.

[0112] The signal inputted into the wireless tag 3 is modulated for the information held in the wireless tag 3, and the modulating signal is emitted from the wireless tag 3. It is received by the wireless tag receiving antenna 63 of the question section 15, and the



modulating signal emitted from this wireless tag 3 is inputted into the demodulator 64 which consists of synchronous detectors etc. On the other hand, the signal sent out from the antenna 24 of the bidirectional Radio Communications Department 14 which received with the bidirectional wireless receiving antenna 62 is also inputted into a demodulator 64, a mixed recovery is carried out with the modulating signal from the wireless tag 3, and the modulating signal from the wireless tag 3 restores to the question section 15. The information to which it restored in the demodulator 64 lets the signal-processing machine 65 pass, and is taken out from the recovery signal output part 66. The information taken out from the wireless tag 3 is accumulated in the signal-processing machine 65, or can also be transmitted to other radio communication equipments 19 by the two-way communication section 14.

[0113] Moreover, when it becomes irregular by simple ASK etc. in the wireless tag 3, the bidirectional wireless receiving antenna 62 is it not being necessarily required, and the wireless tag receiving antenna's 63 receiving the modulating signal from the wireless tag 3, and carrying out AM recovery with a demodulator 64, and can also take out the information on the wireless tag 3.

[0114] Thus, in the radio communication equipment 13 of this operation gestalt, since information is read in the wireless tag 3 using the signal transmitted from the bidirectional Radio Communications Department 24, if the wireless tag 3 is read in case it is simplified sharply and an interrogator performs the communication link with other radio communication equipments 19, it can use an electric wave effectively.

[0115] With the operation gestalt of further others of this invention, a separate antenna may not receive the modulated wave emitted from the signal and the wireless tag 3 from the bidirectional Radio Communications Department 14 like the question section 15 of said operation gestalt shown in drawing 11, but as shown in drawing 12, the same antenna 67 may receive. In this case, since one antenna 67 receives the signal from the bidirectional Radio Communications Department 14, and the modulating signal from the wireless tag 3, both phase contrast cannot be set up freely. Therefore, if these signals have a specific reception relation, since a demodulator 65 is a synchronous-detection method, the Nur point (a recovery output is set to 0 on specific conditions) peculiar to a synchronous detection will produce it. This problem is solvable by using the frequency-hopping method currently indicated by JP,7-131403.A. By considering as such a configuration, simplification and a miniaturization of the question section 16 can be attained.

[0116] Moreover, it is good also as a configuration which prepares two antennas for the bidirectional Radio Communications Department 14 of said operation gestalt

shown in drawing 10 with the operation gestalt of further others of this invention. Drawing 13 is an enlarged drawing near [ in the bidirectional Radio Communications Department 17 of this operation gestalt ] the antenna. The bidirectional Radio Communications Department 17 is the same configuration as the conventional bidirectional radio communication equipment 1, and only the parts of an antenna differ. The bidirectional Radio Communications Department 17 of this operation gestalt has the antenna changeover switch 68 which switches the wireless tag transmitting antenna 68 which sends a signal to the wireless tag 3 other than the antenna 24 which performs the communication link with other radio communication equipments 19, and an antenna 24 and the wireless tag antenna 68. Communication link sensibility with the wireless tag 3 can be raised to the wireless tag transmitting antenna 68 by using an antenna with high directivity compared with an antenna 24.

[0117] moreover, in the radio communication equipments 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 of each operation gestalt mentioned above Although only the actuation which reads the information accumulated in the wireless tag 3 in the communication link with the wireless tag 3 is described, write-in actuation of the information on the wireless tag 3 Usually, for example, an ASK modulation can be given to the sending signal of a radio communication equipment as it carries out, and it can realize easily by getting over with the wireless tag 3 etc.

[0118]

[Effect of the Invention] According to this invention, the same equipment can perform the communication link with other radio communication equipments, and the communication link with a wireless tag as mentioned above, therefore, the equipment which performs the communication link with other radio communication equipments — compared with the case where both of equipment who perform the communication link with the wireless tag to call are employed separately, simplification and a miniaturization of the configuration of equipment can be attained and equipment can be built more to a low price.

[0119] Furthermore, the wireless tag information which was acquired in the mobile environment of premises, a wide area, etc. by performing the communication link with other radio communication equipments and a wireless tag by wireless in addition to fixed use can be immediately transmitted to the remote information centre which manages the information on this wireless tag, for example, and a wireless tag can also be provided with information from an information centre.

[0120] Moreover, since the communication link with other radio communication equipments and the communication link with a wireless tag can be performed using

the signal made to send from the same source of transmission according to this invention, the configuration of equipment can be simplified and the miniaturization of equipment can be attained. Furthermore, a manufacturing cost can be held down. [0121] Moreover, according to this invention, since one antenna performs the communication link with other radio communication equipments and a wireless tag, equipment can be simplified and the miniaturization of equipment can be attained. Furthermore, a manufacturing cost can be held down.

[0122] Moreover, since it has the antenna which performs two-way communication with other radio communication equipments, and the antenna which receives the signal from a wireless tag according to this invention, it can communicate using the antenna which fitted the communication link with other radio communication equipments and a wireless tag, respectively.

[0123] Moreover, since a signal can be transmitted to a wireless tag with the antenna of a bidirectional radio means to perform a wide area communication link while being able to attain simplification and a miniaturization of equipment, since according to this invention it is common and the antenna which communicates with other radio communication equipments, and the antenna which transmits a signal to a wireless tag are used, the communication link range of a wireless tag becomes large.

[0124] Moreover, since the signal transmitted to the signal and wireless tag which are transmitted to other radio communication equipments depending on a communication mode is modulated with a common modulator according to this invention, simplification and a miniaturization can be attained for equipment. Furthermore, a manufacturing cost can be held down.

[0125] Moreover, since it restores to the signal received from the signal and wireless tag which were received from other radio communication equipments with a common recovery means according to this invention, equipment can be simplified and equipment can be miniaturized. Furthermore, a manufacturing cost can be held down. [0126] Moreover, according to this invention, only by equipping a bidirectional radio means with a wireless tag transmitting antenna and a wireless tag receiving antenna, and a wireless tag recovery means, since bidirectional radio and the communication link with a wireless tag can be performed, other radio communication equipments, and a wireless tag and the radio communication equipment which can be communicated can be constituted easily, and simplification and a miniaturization of equipment can be attained.

[0127] Moreover, according to this invention, since it can carry out to the communication link with other radio communication equipments and a wireless tag

using the almost same components, simplification and a miniaturization of equipment can be attained and a manufacturing cost can be reduced.

[0128] Moreover, since the signal transmitted by the signal coupler from other radio communication equipments and the signal transmitted from a wireless tag are alternatively combined with a demodulator according to this invention, it is possible to restore to said two signals with one demodulator.

[0129] Moreover, according to this invention, since the bidirectional wireless transceiver antenna of a bidirectional radio means and the wireless tag transmitting antenna of a question means are used in common, as occasion demands, it is more wide range and the communication link with a wireless tag can be performed.

[0130] Moreover, according to this invention, the signal transmitted from transmission and the wireless tag of the signal to a wireless tag with one antenna is receivable with a signal eliminator by that which can separate the sending signal and input signal of a wireless tag.

[0131] Moreover, according to this invention, the signal from transmission and other radio communication equipments of the signal to other radio communication equipments is receivable with one antenna with a transmission-and-reception eliminator.

[0132] Moreover, since it restores to the signal transmitted from a wireless tag using the subcarrier sent in the source of transmission according to this invention, it is not necessary to make independently the source of dispatch for performing a synchronous detection.

[0133] Moreover, since it restores to the signal which takes out a part of subcarrier oscillated in the source of transmission, and is transmitted from a wireless tag using this subcarrier according to this invention, it is not necessary to make the source of dispatch for a synchronous detection independently.

[0134] Moreover, according to this invention, even if a question means does not have a source of transmission, it can transmit a signal to a wireless tag from the antenna of a bidirectional radio means, can receive the information from a wireless tag, and can simplify equipment. Furthermore, since the communication link energy scattered about on the occasion of the communication link to other radio communication equipments can be used and the communication link with a wireless tag can be performed, it is useful also to energy saving of an information communication link. [0135] moreover, the thing for which a common antenna performs transmission of a signal to a wireless tag with transmission and reception of the signal to other radio communication equipments according to this invention --- equipment can be

miniaturized and a manufacturing cost can be held down.

[0136] Moreover, according to this invention, since a separate antenna performs transmission of a signal to a wireless tag, it can communicate with transmission and reception of the signal to other radio communication equipments using the antenna suitable for each communication link.

[0137] Moreover, according to this invention, since the same antenna receives the signal from a wireless tag, and the signal from a bidirectional radio means, equipment can be simplified and it can miniaturize.

[0138] Moreover, according to this invention, since a separate antenna receives the signal from a wireless tag, and the signal from a bidirectional radio means, it can communicate using the antenna suitable for each communication link.

[0139] Moreover, even if a question means does not have a source of transmission, when a signal is transmitted to other radio communication equipments from a radio means according to this invention, The signal which a signal is transmitted also to a wireless tag at coincidence, and receives the signal returned from a wireless tag, and is transmitted from a bidirectional radio means is received directly, and since these signals are mixed and it gets over, even if a question means does not have a source of transmission, it can perform the communication link with a wireless tag.

[0140] Moreover, since a question means receives the signal transmitted from a bidirectional radio means with one antenna, and the signal transmitted from a wireless tag according to this invention, simplification and a miniaturization of equipment can be attained.

[0141] Moreover, since the radio communications system which consists of said radio communication equipment and wireless tag can be constituted according to this invention, information can be immediately transmitted to the management equipment which manages the information on a wireless tag for the information received from the wireless tag with the question means with a bidirectional radio means, for example. Moreover, since a radio communication equipment performs the communication link with other radio communication equipments and a wireless tag by wireless, it does not have constraint of installation etc.

[0142] Moreover, according to this invention, information can be written in a wireless tag with said radio communication equipment. Information can be transmitted to a radio communication equipment from the management equipment which follows, for example, manages the information on a wireless tag. information can be transmitted to a wireless tag from a radio communication equipment, the information on a wireless tag can be written in, and a wireless tag can be managed exactly.

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[Translation done.]

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**TECHNICAL FIELD**

[Field of the Invention] This invention relates to the radio communication equipment and radio communications system which have a RFID function and a bidirectional radio function.

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**PRIOR ART**

[Description of the Prior Art] Conventionally, there is a communication device using wireless. Drawing 14 is drawing showing the basic configuration of the common

bidirectional radio communication equipments 1, such as wireless LAN (Local AreaNetwork) and a portable telephone. The bidirectional radio communication equipment 1 and other radio communication equipments 19 which perform bidirectional radio are shown in drawing 14 . Other radio communication equipments 19 are other bidirectional radio communication equipments and base transceiver stations where the bidirectional radio communication equipment 1 communicates.

[0003] The transmitting RF (Radio Frequency) section 22 to which the bidirectional radio communication equipment 1 changes from the source 20 of transmission, a modulator 21, power amplification, a filter, etc., and the signal transmitted to other radio communication equipments 19. The signal transmitted from a radio communication equipment 19 The receiving RF section 25 which consists of the transmission-and-reception eliminators 23, such as a switch to separate or a diplexer, the antenna 24 which a signal transmits and receives, low noise amplifier, a filter, etc., the demodulator 26 which restores to the received signal, the data transmitted to other radio communication equipments 19 It is constituted including the recovery signal output part 28 which takes out the information signal input section 27 to input, data, etc. Although the signal-processing section which otherwise processes the data inputted into a modulator 21 from the information signal input section 27 in the bidirectional radio communication equipment 1, the synthesizer control section for changing the frequency of the subcarrier sent in the source 20 of transmission in performing the FURKEN C hopping which changes the frequency of a signal to transmit, etc. are required, it omits in drawing 14 . The transmission-and-reception eliminator 23 uses a switch or a diplexer properly with TDD (Time Division Duplex) or a FDD (Frequency DivisionDuplex) method.

[0004] The bidirectional radio communication equipment 1 of drawing 14 explains actuation below as a communication device of a TDD method. The subcarrier sent in the source 20 of transmission of the bidirectional radio communication equipment 1 is modulated with a modulator 21 by the information signal inputted from the information signal input section 27. The modulating signal modulated with the modulator 21 is transmitted toward other radio communication equipments 19 through the transmitting RF section 22 and the transmission-and-reception separation section (switch) 23 from an antenna 24. On the other hand, an antenna 24 receives, it restores to the modulating signal transmitted to the bidirectional radio communication equipment 1 from other radio communication equipments 19 with a demodulator 26 via the transmission-and-reception eliminator 23 and the receiving RF section 25, and an information signal is taken out from the recovery signal output part 28. Actuation of

the above bidirectional radio communication equipment 1 is actuation of general bidirectional radio.

[0005] Drawing 15 is drawing showing the interrogator 2 and the wireless tag 3 of a common RFID system. An interrogator 2 is the communication device which used wireless, and is constituted including the demodulator 34 which consists of the signal eliminator 32 which consists of the source 30 of transmission, a modulator 31, a circulator, a directional coupler, etc., an antenna 33, a synchronous detector, etc., the tag information recovery signal output part 35, etc. Although the information signal input section which inputs the transmit data to RF transmitting section, RF receive section, the signal-processing section, and the wireless tag 3 is required for others, it is omitting in drawing 15 . The wireless tag 3 is constituted including the memory 39 which records the tag recovery section 38 which restores to the tag antenna 36 which receives the signal from an interrogator 2 and transmits a signal to an interrogator 2, the tag modulator 37 which modulates the signal transmitted to an interrogator 2, and the signal received with the tag antenna 36, data, etc.

[0006] Below, actuation of an interrogator 2 and the wireless tag 3 is explained. When reading the information on the wireless tag 3, an interrogator 2 becomes irregular with a modulator 31, and the subcarrier sent in the source 30 of transmission of an interrogator 2 is transmitted from an antenna 33 through the signal eliminator 32. It is received by the tag antenna 36 of the wireless tag 3, and the modulating signal transmitted from an antenna 33 receives a modulation using the are recording information on memory 39 with the tag modulator 37 of the wireless tag 3. The signal modulated with the wireless tag 3 is transmitted to an interrogator 2 from the wireless tag 3. An interrogator 2 receives the signal transmitted from the wireless tag 3 with an antenna 33. The modulating signal received with the antenna 33 is inputted into a demodulator 34 through the signal eliminator 32, and after getting over with a demodulator 34, it is taken out from the tag information recovery signal output part 35. In writing information in the wireless tag 3, using write-in information, the subcarrier sent in the source 30 of transmission with a modulator 31 is modulated, and it transmits to the wireless tag 3, and with the wireless tag 3, it restores to the received modulating signal in the tag recovery section 38, and writes in memory 39. Actuation of the above interrogator 2 and the wireless tag 3 is actuation of the RFID system generally known well.

[0007] From the former, the RFID system is utilized in FA (Factory Automation) business etc. In recent years, it is broadly used for the picking system which classifies stock control and an article in the PD or the circulation field by the miniaturization of

a wireless tag, or de-battery loess-ization. The information on the wireless tag acquired by the interrogator is immediately sent to an access point using bidirectional radio communication equipments, such as wireless LAN prepared apart from the interrogator, and is processed in the management processing section, and the gestalt which manages goods often consists of such PD and the circulation fields. Moreover, also when writing information in a wireless tag, it is performed by the directions from the management processing section using an interrogator.

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**EFFECT OF THE INVENTION**

[Effect of the Invention] According to this invention, the same equipment can perform the communication link with other radio communication equipments, and the communication link with a wireless tag as mentioned above, therefore, the equipment which performs the communication link with other radio communication equipments — compared with the case where both of equipment who perform the communication link with the wireless tag to call are employed separately, simplification and a miniaturization of the configuration of equipment can be attained and equipment can be built more to a low price.

[0119] Furthermore, the wireless tag information which was acquired in the mobile environment of premises, a wide area, etc. by performing the communication link with other radio communication equipments and a wireless tag by wireless in addition to fixed use can be immediately transmitted to the remote information centre which manages the information on this wireless tag, for example, and a wireless tag can also

be provided with information from an information centre.

[0120] Moreover, since the communication link with other radio communication equipments and the communication link with a wireless tag can be performed using the signal made to send from the same source of transmission according to this invention, the configuration of equipment can be simplified and the miniaturization of equipment can be attained. Furthermore, a manufacturing cost can be held down. [0121] Moreover, according to this invention, since one antenna performs the communication link with other radio communication equipments and a wireless tag, equipment can be simplified and the miniaturization of equipment can be attained. Furthermore, a manufacturing cost can be held down.

[0122] Moreover, since it has the antenna which performs two-way communication with other radio communication equipments, and the antenna which receives the signal from a wireless tag according to this invention, it can communicate using the antenna which fitted the communication link with other radio communication equipments and a wireless tag, respectively.

[0123] Moreover, since a signal can be transmitted to a wireless tag with the antenna of a bidirectional radio means to perform a wide area communication link while being able to attain simplification and a miniaturization of equipment, since according to this invention it is common and the antenna which communicates with other radio communication equipments, and the antenna which transmits a signal to a wireless tag are used, the communication link range of a wireless tag becomes large.

[0124] Moreover, since the signal transmitted to the signal and wireless tag which are transmitted to other radio communication equipments depending on a communication mode is modulated with a common modulator according to this invention, simplification and a miniaturization can be attained for equipment. Furthermore, a manufacturing cost can be held down.

[0125] Moreover, since it restores to the signal received from the signal and wireless tag which were received from other radio communication equipments with a common recovery means according to this invention, equipment can be simplified and equipment can be miniaturized. Furthermore, a manufacturing cost can be held down.

[0126] Moreover, according to this invention, only by equipping a bidirectional radio means with a wireless tag transmitting antenna and a wireless tag receiving antenna, and a wireless tag recovery means, since bidirectional radio and the communication link with a wireless tag can be performed, other radio communication equipments, and a wireless tag and the radio communication equipment which can be communicated can be constituted easily, and simplification and a miniaturization of equipment can be

attained.

[0127] Moreover, according to this invention, since it can carry out to the communication link with other radio communication equipments and a wireless tag using the almost same components, simplification and a miniaturization of equipment can be attained and a manufacturing cost can be reduced.

[0128] Moreover, since the signal transmitted by the signal coupler from other radio communication equipments and the signal transmitted from a wireless tag are alternatively combined with a demodulator according to this invention, it is possible to restore to said two signals with one demodulator.

[0129] Moreover, according to this invention, since the bidirectional wireless transceiver antenna of a bidirectional radio means and the wireless tag transmitting antenna of a question means are used in common, as occasion demands, it is more wide range and the communication link with a wireless tag can be performed.

[0130] Moreover, according to this invention, the signal transmitted from transmission and the wireless tag of the signal to a wireless tag with one antenna is receivable with a signal eliminator by that which can separate the sending signal and input signal of a wireless tag.

[0131] Moreover, according to this invention, the signal from transmission and other radio communication equipments of the signal to other radio communication equipments is receivable with one antenna with a transmission-and-reception eliminator.

[0132] Moreover, since it restores to the signal transmitted from a wireless tag using the subcarrier sent in the source of transmission according to this invention, it is not necessary to make independently the source of dispatch for performing a synchronous detection.

[0133] Moreover, since it restores to the signal which takes out a part of subcarrier oscillated in the source of transmission, and is transmitted from a wireless tag using this subcarrier according to this invention, it is not necessary to make the source of dispatch for a synchronous detection independently.

[0134] Moreover, according to this invention, even if a question means does not have a source of transmission, it can transmit a signal to a wireless tag from the antenna of a bidirectional radio means, can receive the information from a wireless tag, and can simplify equipment. Furthermore, since the communication link energy scattered about on the occasion of the communication link to other radio communication equipments can be used and the communication link with a wireless tag can be performed, it is useful also to energy saving of an information communication link.

[0135] moreover, the thing for which a common antenna performs transmission of a signal to a wireless tag with transmission and reception of the signal to other radio communication equipments according to this invention — equipment can be miniaturized and a manufacturing cost can be held down.

[0136] Moreover, according to this invention, since a separate antenna performs transmission of a signal to a wireless tag, it can communicate with transmission and reception of the signal to other radio communication equipments using the antenna suitable for each communication link.

[0137] Moreover, according to this invention, since the same antenna receives the signal from a wireless tag, and the signal from a bidirectional radio means, equipment can be simplified and it can miniaturize.

[0138] Moreover, according to this invention, since a separate antenna receives the signal from a wireless tag, and the signal from a bidirectional radio means, it can communicate using the antenna suitable for each communication link.

[0139] Moreover, even if a question means does not have a source of transmission, when a signal is transmitted to other radio communication equipments from a radio means according to this invention, The signal which a signal is transmitted also to a wireless tag at coincidence, and receives the signal returned from a wireless tag, and is transmitted from a bidirectional radio means is received directly, and since these signals are mixed and it gets over, even if a question means does not have a source of transmission, it can perform the communication link with a wireless tag.

[0140] Moreover, since a question means receives the signal transmitted from a bidirectional radio means with one antenna, and the signal transmitted from a wireless tag according to this invention, simplification and a miniaturization of equipment can be attained.

[0141] Moreover, since the radio communications system which consists of said radio communication equipment and wireless tag can be constituted according to this invention, information can be immediately transmitted to the management equipment which manages the information on a wireless tag for the information received from the wireless tag with the question means with a bidirectional radio means, for example. Moreover, since a radio communication equipment performs the communication link with other radio communication equipments and a wireless tag by wireless, it does not have constraint of installation etc.

[0142] Moreover, according to this invention, information can be written in a wireless tag with said radio communication equipment. Information can be transmitted to a radio communication equipment from the management equipment which follows, for

example, manages the information on a wireless tag, information can be transmitted to a wireless tag from a radio communication equipment, the information on a wireless tag can be written in, and a wireless tag can be managed exactly.

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**TECHNICAL PROBLEM**

[Problem(s) to be Solved by the Invention] Although the conventional bidirectional radio communication equipment 1 mentioned above has the function which communicates with other bidirectional radio communication equipments, it does not have the function to perform the communication link with a wireless tag. Moreover, although the interrogator 2 of the conventional RFID system has the function to perform the communication link with the wireless tag 3, it does not have an active bidirectional radio function like a portable telephone, for example.

[0009] Moreover, in the picking system using the conventional RFID system, since bidirectional radio communication equipments, such as wireless LAN, and the interrogator of a RFID system are isolated systems in which both have a source of transmission, equipment becomes large and cost starts.

[0010] From now on, improvement in the speed of mobile radio, such as a portable telephone and Bluetooth, is interlocked with, and the activity of the RFID system in delivery business, mail delivery business, etc. becomes very effective. For this reason, it sets especially to use in a mobile environment, equipment is simplified and miniaturized, and a radio communication equipment which can utilize a RFID system is desired by the low price. Furthermore, a radio communication equipment with which

the bidirectional radio function in which a broader-based communication link is also possible, and the function of the interrogator of a RFID system were united is desired.

[0011] The purpose of this invention is offering the radio communication equipment with which full-scale bidirectional radio communication equipments, such as an interrogator's, wireless LAN's, a cellular phone's, etc. in a RFID system, were united with the easy configuration, and the radio communications system using this radio communication equipment.

[0012] Moreover, other purposes of this invention are offering the radio communication equipment and radio communications system which perform the communication link with a wireless tag using the sending signal to other radio communication equipments.

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**MEANS**

[Means for Solving the Problem] A bidirectional radio means for this invention to modulate the subcarrier sent from the source of transmission, to transmit to other radio communication equipments from an antenna, to receive the signal from other radio communication equipments with an antenna, and to get over. A signal is transmitted for the subcarrier sent from the source of transmission to a wireless tag from an antenna in a modulation or no becoming irregular. It is the radio communication equipment characterized by having the question means which reads the information which receives the signal which answers this signal, becomes irregular based on the information memorized, and is transmitted from a wireless tag with an

antenna, gets over, and is memorized by the wireless tag.

[0014] If this invention is followed, a bidirectional radio means can perform the communication link with other radio communication equipments, and a question means can perform the communication link with a wireless tag. Therefore, it is not necessary to use for the communication link with other radio communication equipments and a wireless tag like before two equipments which became independent according to the individual.

[0015] Moreover, this invention is characterized by the source of transmission which sends the subcarrier of said bidirectional radio means and the source of transmission which sends the subcarrier of a question means being common.

[0016] If this invention is followed, since the source of transmission of a bidirectional radio means and the source of transmission of an interrogator will be communalized and the communication link with other radio communication equipments and the communication link with a wireless tag will be performed using the subcarrier made to send from one source of transmission, simplification and a miniaturization of equipment can be attained and reduction of a manufacturing cost can be aimed at.

[0017] Moreover, this invention is characterized by the antenna of said bidirectional radio means and the antenna of said question means being common.

[0018] If this invention is followed, one antenna will perform the communication link with other radio communication equipments and a wireless tag. Therefore, simplification and a miniaturization of equipment can be attained and reduction of a manufacturing cost can be aimed at.

[0019] Moreover, as for the antenna of said bidirectional radio means, and the antenna of said question means, this invention is characterized by being prepared separately, respectively.

[0020] If this invention is followed, since it will have two antennas of the antenna which performs bidirectional radio with other radio communication equipments, and the antenna which performs the communication link with a wireless tag, each communication link can be performed using the antenna which fitted the communication link with other radio communication equipments and a wireless tag, respectively.

[0021] Moreover, this invention is characterized by the antenna of said bidirectional radio means and the antenna transmitted to the wireless tag of said question means being common.

[0022] When transmitting a signal to this invention \*\*\*\*\* and a wireless tag, the antenna of a bidirectional radio means to perform a wide area communication link can

be used, and while it comes out to attain simplification and a miniaturization of equipment, the communication link range of a wireless tag becomes large. Moreover, while performing the communication link to other radio communication equipments, an electric wave can be effectively used by transmitting a wireless tag signal using the sending signal.

[0023] Moreover, this invention is characterized by becoming irregular with the modulation means by which the modulation of the subcarrier of said bidirectional radio means and the modulation of the subcarrier of said question means are common.

[0024] If this invention is followed, the signal transmitted to the signal and wireless tag which are transmitted to other radio communication equipments will be modulated with a common modulator. Therefore, simplification and a miniaturization of equipment can be attained.

[0025] Moreover, this invention is characterized by getting over with the recovery means by which the recovery of the signal transmitted from other radio communication equipments and the recovery of the signal transmitted from a wireless tag are common.

[0026] If this invention is followed, it will restore to the signal received from the reception carried out from other radio communication equipments, and a wireless tag with a common demodulator. Therefore, simplification and a miniaturization of equipment can be attained.

[0027] Moreover, the source of transmission where, as for said bidirectional radio means, this invention sends a subcarrier, A modulation means to modulate the subcarrier sent in said source of transmission, and the bidirectional wireless transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication equipments, It has a recovery means to restore to the signal received from other radio communication equipments. Said question means The wireless tag transmitting antenna which transmits a signal to a wireless tag using the subcarrier sent in the source of transmission of said bidirectional radio means, It is characterized by having the wireless tag receiving antenna which receives the signal transmitted from a wireless tag, and a wireless tag recovery means to restore to the signal received with the wireless tag receiving antenna.

[0028] If this invention is followed, a question means will transmit a signal to a wireless tag using the subcarrier sent in the source of transmission of a bidirectional radio means. Therefore, bidirectional radio and the communication link with a wireless tag can be performed only by equipping a bidirectional radio means with a wireless tag



transmitting antenna and a wireless tag receiving antenna, and a wireless tag recovery means. Therefore, simplification and a miniaturization of equipment can be attained.

[0029] Moreover, the source of transmission where, as for said bidirectional radio means, this invention sends a subcarrier, A modulation means to modulate the subcarrier sent in said source of transmission, and the bidirectional wireless transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication equipments. It has a recovery means to restore to the signal received from other radio communication equipments. Said question means The wireless tag transmitting antenna which transmits a signal to a wireless tag using the subcarrier sent in the source of transmission of said bidirectional radio means, It has the wireless tag receiving antenna which receives the signal transmitted from a wireless tag, and is characterized by restoring to the signal transmitted from a wireless tag with the recovery means of said bidirectional radio means.

[0030] If this invention is followed, a question means will restore to the signal which transmits a signal to a wireless tag using the subcarrier sent with a bidirectional radio means, and is transmitted from a wireless tag with the demodulator of a bidirectional radio means. Bidirectional radio and the communication link with a wireless tag can be performed only by equipping a bidirectional radio means with a wireless tag transmitting antenna and a wireless tag receiving antenna by offering the multifunctional demodulator with which a bidirectional radio means can restore also to the signal transmitted from a wireless tag. Therefore, simplification and a miniaturization of equipment can be attained.

[0031] Moreover, this invention is characterized by having the signal coupler which combines alternatively with a demodulator the signal transmitted from the signal or wireless tag transmitted from other radio communication equipments.

[0032] If this invention is followed, since the signal transmitted by the signal coupler from other radio communication equipments and the signal transmitted from a wireless tag will be alternatively combined with a demodulator, said two signals are not inputted into one demodulator at coincidence. Therefore, it is possible to restore to said two signals with one demodulator.

[0033] Moreover, this invention is characterized by the bidirectional wireless transceiver antenna of said bidirectional radio means and the wireless tag transmitting antenna of a question means being common antennas.

[0034] If this invention is followed, since the same antenna as the communication link with other radio communication equipments and transmission of the signal to a

wireless tag will be used, simplification and a miniaturization of equipment can be attained. When transmitting a signal to a wireless tag, the antenna of a bidirectional radio means to perform a wide area communication link can be used, and the communication link range of a wireless tag becomes large.

[0035] Moreover, this invention is characterized by having the signal eliminator which sends the signal transmitted from the wireless tag which received the signal from the source of transmission with delivery and an antenna at the antenna to a recovery means to restore to this signal.

[0036] If this invention is followed, since the signal to a wireless tag to transmit and the signal received from a wireless tag are separable with a signal eliminator, the signal from transmission and the wireless tag of a signal is receivable to a wireless tag with the same antenna.

[0037] Moreover, this invention is characterized by forming the transmission-and-reception eliminator which separates the sending signal to other radio communication equipments, and the input signal from other radio communication equipments.

[0038] If this invention is followed, since it will have transmission-and-reception eliminators, such as a diplexer and a switch, for example, a TDD (Time Division Duplex) method and a FDD (Frequency Division Duplex) method can perform bidirectional radio with other radio communication equipments.

[0039] Moreover, this invention is characterized by restoring to the signal transmitted from a wireless tag using a part of subcarrier sent in the source of transmission.

[0040] If this invention is followed, since it will restore to the signal which takes out a part of subcarrier sent in the source of transmission, for example using the signal distribution box etc., and is transmitted from a wireless tag using this subcarrier, a synchronous detection can be performed even if it does not independently make the source of dispatch for a synchronous detection.

[0041] Moreover, said source of transmission is established for this invention in a bidirectional radio means, and said bidirectional radio means is characterized by having the antenna which transmits a signal to a wireless tag.

[0042] If this invention is followed, a bidirectional radio means has a source of transmission, and even if a question means does not have a source of transmission, it can receive the information on a wireless tag by carrying out wireless tag transmission of the signal sent from the source of transmission of said bidirectional radio means from an antenna. Furthermore, transmission of the signal to a wireless tag and transmission, such as data to other radio communication equipments, can be operated

to coincidence with one sending-signal energy.

[0043] Moreover, this invention is characterized by being carried out by the antenna with common transmission and reception of the signal to other radio communication equipments which a bidirectional radio means performs and transmission of the signal to a wireless tag.

[0044] If this invention is followed, since the communication link with other radio means of a bidirectional radio means and the signal to a wireless tag will be transmitted with the same antenna, simplification and a miniaturization of equipment can be attained.

[0045] Moreover, this invention is characterized by being carried out by the antenna with separate transmission and reception of the signal to other radio communication equipments which a bidirectional radio means performs and transmission of the signal to a wireless tag.

[0046] If this invention is followed, since an antenna with separate transmission and reception of the signal to other radio communication equipments and reception of the signal to a wireless tag will perform, the antenna suitable for a communication link can be used for each.

[0047] Moreover, this invention is characterized by equipping a question means with the antenna which receives the signal transmitted from the signal and bidirectional radio means which were modulated based on information with the wireless tag.

[0048] If this invention is followed, since the same antenna will receive the signal from a wireless tag, and the signal from a bidirectional radio means and it will restore to a signal, simplification and a miniaturization of equipment can be attained.

[0049] Moreover, this invention is characterized by equipping a question means with the antenna which receives the signal modulated based on information with the wireless tag, and the antenna which receives the signal transmitted from the bidirectional radio means separately.

[0050] If this invention is followed, since a question means receives the signal from a wireless tag, and the signal from a bidirectional radio means with a separate antenna, using the antenna suitable for reception of each signal, it can receive a signal and it can be restored to it.

[0051] Moreover, the source of transmission where, as for said bidirectional radio means, this invention sends a subcarrier, A modulation means to modulate the subcarrier sent in said source of transmission, and the bidirectional transceiver antenna which transmits the signal from said modulation means to other radio communication equipments, and receives a signal from other radio communication

equipments, It has a recovery means to restore to the signal received from other radio communication equipments. Said question means It is characterized by having the recovery means which carries out the mixed recovery of the signal received with the bidirectional wireless receiving antenna which receives the signal transmitted from the bidirectional transceiver antenna of said bidirectional radio means, the wireless tag receiving antennas which receive the signal transmitted from a wireless tag, and these antennas.

[0052] If this invention follows, since the recovery means of the signal which receives the signal transmitted from the antenna of a bidirectional radio means with a bidirectional wireless receiving antenna, receives the signal transmitted from a wireless tag with a wireless tag receiving antenna, and is transmitted from a bidirectional radio means, and the signal which are transmitted from a wireless tag will mix and carry out, even if a question means is not equipped with the source of transmission, it can perform the synchronous detection of the signal transmitted from a wireless tag.

[0053] Moreover, this invention is characterized by the bidirectional wireless receiving antenna and wireless tag receiving antenna of said question means being common.

[0054] If this invention is followed, since the same antenna will receive the signal transmitted from the bidirectional radio means of a question means, and the signal transmitted from a wireless tag, simplification and a miniaturization of equipment can be attained.

[0055] Moreover, this invention is a radio communications system characterized by consisting of said radio communication equipment and a wireless tag.

[0056] If this invention is followed, since the radio communications system which consists of said radio communication equipment and wireless tag can be constituted, information can be immediately transmitted to the management equipment which manages the information on a wireless tag for the information received from the wireless tag with the question means with a bidirectional radio means, for example. Moreover, since a radio communication equipment performs the communication link with other radio communication equipments and a wireless tag by wireless, it does not have constraint of installation etc.

[0057] Moreover, it is characterized by the ability of a radio communication equipment for this invention to write information in said wireless tag, and write information in a wireless tag on radio.

[0058] If this invention is followed, information can be written in a wireless tag with said radio communication equipment. Information can be transmitted to a radio

communication equipment from the management equipment which follows, for example, manages the information on a wireless tag, information can be transmitted to a wireless tag from a radio communication equipment, the information on a wireless tag can be written in, and a wireless tag can be managed exactly.

[0059]

[Embodiment of the Invention] Drawing 1 is drawing showing the radio structure of a system containing the radio communication equipment 4 which is one gestalt of operation of this invention. The radio communications system shown in drawing 1 consists of other radio communication equipments 19 with which the wireless tag 3 and radio communication equipment 4 other than a radio communication equipment 4 perform bidirectional radio. In addition, since the wireless tag 3 and other radio communication equipments 19 which are shown in drawing 1 are the same as the wireless tag 3 and other radio communication equipments 19 which were shown in drawing 14 and drawing 15, they attach the same sign and omit the explanation.

Moreover, the radio communications system of each operation gestalt of not only this operation gestalt but this invention is constituted including said wireless tag 3 and other radio communication equipments 19. The wireless tag 3 can write information in memory by wireless.

[0060] A radio communication equipment 4 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone. A radio communication equipment 4 transmits a signal to the source 40 of transmission, a signal distribution box 41, a modulator 42, the transmitting RF section 43, the signal eliminator 44, the transmission-and-reception eliminator 45, and other radio communication equipments 19. The bidirectional wireless transceiver antenna which receives a signal from other radio communication equipments 19, The wireless tag transmitting antenna which transmits a signal to the wireless tag 3, As a wireless tag receiving antenna which receives the signal transmitted from the wireless tag 3 It is constituted including the functioning bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, the receiving RF section 47, a demodulator 48, the wireless tag demodulator 49, the information signal input section 50, the recovery signal output part 51, and the tag recovery signal output part 52.

[0061] The bidirectional radio means of a radio communication equipment 4 A

subcarrier The subcarrier sent in the source 40 of transmission which sends, and the source 40 of transmission The transmission-and-reception eliminator 45, the bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46 which separate the signal transmitted from the transmitting RF section 43 which consists of the modulator 42 and filter which are a modulation means to become irregular, amplifier, etc., the signal transmitted to other radio communication equipments 19, and other radio communication equipments 19. The information to which it restored with the information signal input section 50 which inputs the information for modulating a subcarrier with the receiving RF section 47 which consists of a filter, amplifier, etc., the demodulator 48 which is a recovery means to restore to the signal transmitted from other radio communication equipments 19, and a modulator 42, and a demodulator 48 It is constituted including the outputting recovery signal output part 51.

[0062] The question means of a radio communication equipment 4 consists of the transmitting RF section 43 and circulator which consist of a signal distribution box 41 which takes out the subcarrier sent in the source 40 of transmission which sends a subcarrier, and the source 40 of transmission, a modulator 42 which modulates the subcarrier sent in the source 40 of transmission, a filter, amplifier, etc., a coupler, etc. The signal transmitted to the wireless tag 3, and the signal transmitted from the wireless tag 3 With the wireless tag demodulator 49 and modulator 42 which are a wireless tag recovery means to restore to the signal transmitted from the receiving RF section 47 which consists of the signal eliminator 44 to separate, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transceiver common antenna 46, a filter, amplifier, etc., and the wireless tag 3, a subcarrier It is constituted including the information signal input section 50 which inputs the information for becoming irregular, and the tag recovery signal output part 52 which outputs the signal to which it restored with the wireless tag demodulator 48.

[0063] With the bidirectional radio means and question means which were mentioned above, although the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transceiver common antenna 46, and the information signal input section 50 are share-sized as radical headquarters, a modulator 42, the information signal input section 50, and transmitting RF section 43 grade may divide according to the signal aspect which communicates.

[0064] When performing the FURKEN C hopping which communicates while it may be

fixed and a frequency is changed, the frequency of the subcarrier sent in the source 40 of transmission of a radio communication equipment 4 may be constituted so that it may have the frequency adjustable function to change the frequency which sends in the source 40 of transmission. Moreover, in drawing 1., when a switch is used for the transmission-and-reception eliminator 45, the signal-processing section which processes the signal outputted from the signal-processing section, the recovery signal output part 51, and the tag recovery signal output part 52 which process the signal inputted into the control section for changing this switch and the information signal input section 50 is omitting.

[0065] Next, actuation of a radio communication equipment 4 is explained. First, the case where bidirectional radio with other radio communication equipments 19 is performed is explained. When performing the communication link with other radio communication equipments 19, the bidirectional radio means mentioned above is used. When transmitting a signal to other radio communication equipments 19, the subcarrier sent in the source 40 of transmission is modulated with a modulator 42 based on the information inputted from the information signal input section 50. The modulating signal modulated with the modulator 42 is transmitted via the transmitting RF section 43, the signal eliminator 44, and the transmission-and-reception eliminator 45 from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46. This signal is sent to other corresponding radio communication equipments 19. With this operation gestalt, a switch is used for the transmission-and-reception eliminator 45 as using a TDD (Time Division Duplex) communication link for the communication link with other radio communication equipments 19. On the other hand, when receiving the signal transmitted from other radio communication equipments 19, it is received by bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and the signal transmitted from other radio communication equipments 19 passes along the receiving RF section 47 via the transmission-and-reception eliminator (switch) 45 switched to the reception RF 47 side, and restores to it with a demodulator 48. The information signal to which it restored with the demodulator 48 is taken out from the recovery signal output part 51.

[0066] Next, the case (RFID actuation is called hereafter) where a radio communication equipment 4 is operated as an interrogator of a RFID system is explained. When performing the communication link with the wireless tag 3, the question means mentioned above is used. First, the subcarrier sent in the source 40 of transmission is sent out to the wireless tag 3 through a modulator 42, the

transmitting RF section 43, the signal eliminator 44, and the transmission-and-reception eliminator 45 from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46. Although the modulator 42 used by the communication link with other radio communication equipments 19 is performing the modulation in the communication link with the wireless tag 3 with this operation gestalt, when a difference is in the communication mode of other radio communication equipments 19 and the wireless tag 3, the more nearly optimal modulator may be formed independently. Moreover, the transmitting RF section 43 may also be divided into the optimal gestalt. In forming separately the modulator which performs the communication link with the modulator and the wireless tag 3 which are used for the communication link with other radio communication equipments 19, the two information signal input sections 50 are formed, and it inputs an information signal into each modulator.

[0067] When reading the information currently written in the wireless tag 3, the subcarrier sent in the source 40 of transmission is modulated for the read-out command information for reading the information on the wireless tag 3 with no becoming irregular or a modulator 42. It is transmitted from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and this signal is received by the wireless tag 3. With the wireless tag 3, after receiving the signal transmitted from a radio communication equipment 4, it becomes irregular and transmits by the are recording information which this wireless tag 3 has. It is received by bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and the signal transmitted from the wireless tag 3 is separated by the transmission-and-reception eliminator 45. In RFID actuation, it is fixed to the signal eliminator 44, i.e., transmitting system with modulator 42, side, and the switch which is the transmission-and-reception eliminator 8 is performed in the state of the switch in the time of transmission of \*\* or the bidirectional radio mentioned above. It is also possible to perform RFID actuation by this configuration at the time of transmission to other radio communication equipments 19.

[0068] The signal turned up and transmitted from the wireless tag 3 is sent to the wireless tag demodulator 49, after being separated by the signal eliminator 44. The wireless tag demodulator 49 is a demodulator of the synchronous-detection mold which restores to the signal which inputs a part of subcarrier from the source 40 of transmission taken out by the signal distribution box 41, and is transmitted from the wireless tag 3. Moreover, what arranges and took out the signal distribution box 41 to the output side of a modulator 42 may be used for the signal used for a synchronous

detection with the wireless tag demodulator 49. Moreover, although the wireless tag demodulator 49 of this operation gestalt is a demodulator of a synchronous-detection mold, the wireless tag demodulator 49 may be an independent demodulator. The signal to which it restored in the wireless tag recovery section 49 is taken out from the tag recovery signal output part 52.

[0069] As mentioned above, in the radio communication equipment 4 of this operation gestalt, the source 40 of transmission, the transmission-and-reception eliminator 45, and bidirectional wireless transmission and reception and wireless tag transceiver common antenna 46 grade are share-sized with a question means to perform the communication link with the bidirectional radio means and the wireless tag 3 which perform the communication link with other radio communication equipments 19. Thus, by using each part in common, simplification and a miniaturization of equipment can be attained and a manufacturing cost is also held down. Moreover, what is necessary is just to use a diplexer as a transmission-and-reception eliminator in the wireless radios 4 of this operation gestalt, as what performs a TDD (Time Division Duplex) communication link, in performing a FDD communication link although the transmission-and-reception eliminator 45 was considered as the switch. Moreover, when for example, a bidirectional radio means is used as the base and it constitutes a radio communication equipment 4, it becomes possible to perform not only the communication link with other radio communication equipments 19 but the communication link with the wireless tag 3 with the easy configuration which equips this bidirectional radio means with the signal eliminator 44, the wireless tag demodulator 49, and the tag recovery signal output part 52.

[0070] Drawing 2 is drawing showing the radio structure of a system containing the radio communication equipment 5 which are other operation gestalten of this invention. With the radio communication equipment 5 shown in drawing 2, the same sign is given to the part which overlaps the radio communication equipment 4 of said operation gestalt shown in drawing 1, and the explanation is omitted. Although a radio communication equipment 5 is the almost same configuration as the radio communication equipment 4 of said operation gestalt and is not equipped with a signal eliminator, it is equipped with the wireless tag receiving antenna 53 which receives the signal further transmitted from the wireless tag 3.

[0071] A radio communication equipment 5 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication

link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0072] The bidirectional wireless transceiver antenna which the bidirectional radio means of a radio communication equipment 5 transmits a signal to the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, and other radio communication equipments 19, and receives a signal from other radio communication equipments 19, It is constituted including the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 which functions as a wireless tag transmitting antenna which transmits a signal to the wireless tag 3, the receiving RF section 47, a demodulator 48, the information signal input section 50, and the recovery signal output part 51. Moreover, the question means of the radio means 5 is constituted including the source 40 of transmission, a signal distribution box 41, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76, the wireless tag receiving antenna 53 that receives the signal transmitted from the wireless tag 3, the wireless tag demodulator 49, the information signal input section 50, and the tag recovery signal output part 52.

[0073] In the radio communication equipment 5, the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76, and the information signal input section 50 are share-sized in a bidirectional radio means and a question means. A modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45 as well as the radio communication equipment 4 of drawing 1, etc. may be divided by the communication mode of a both-hands stage. Thus, by using each part in common, simplification and a miniaturization of equipment can be attained and a manufacturing cost is also held down.

[0074] Since communication link actuation with other radio communication equipments 19 is the same as that of the radio communication equipment 4 of said operation gestalt in a radio communication equipment 5, explanation is omitted.

[0075] RFID actuation of a radio communication equipment 5 is explained below. The question means mentioned above is used for the communication link with the wireless tag 3. The subcarrier sent in the source 40 of transmission is sent out through a modulator 42, the transmitting RF section 43, and the transmission-and-reception eliminator 45 from bidirectional wireless transmission and reception and the wireless

tag transmitting common antenna 76. When reading the information currently written in the wireless tag 3, the subcarrier sent in the source 40 of transmission is modulated for the read-out command information for reading the information on the wireless tag 3 with no becoming irregular or a modulator 42. It is transmitted from the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 which has a role of a wireless tag transmitting antenna, and this signal is received by the wireless tag 3. With the wireless tag 3, after receiving the signal transmitted from a radio communication equipment 5, it becomes irregular and sends out by the are recording information which this wireless tag 3 has. It is received by the wireless tag receiving antenna 53, and the signal transmitted from the wireless tag 3 is sent to the wireless tag recovery section 49. The wireless tag recovery section 49 inputs a part of subcarrier from the source 40 of transmission taken out by the signal distribution box 41, and restores to the signal received from the wireless tag 3.

[0076] As mentioned above, a radio communication equipment 5 is equipped with the wireless tag receiving antenna 53 which receives the signal from the wireless tag 3 other than bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76. The sending signal to the wireless tag 3 can perform the communication link with the wireless tag 3 more efficiently by transmitting using the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 which performs a communication link wide range than the communication link with other radio communication equipments, i.e., the communication link with the wireless tag 3, and receiving the signal from the wireless tag 3 using the directive high wireless tag receiving antenna 53.

[0077] Drawing 3 (a) is drawing showing the radio structure of a system containing the radio communication equipment 6 of the operation gestalt of further others of this invention. With the radio communication equipment 6 shown in drawing 3 (a), the same sign is given to the part which overlaps the radio communication equipment 4 of said operation gestalt or radio communication equipment 5 shown in drawing 1 or drawing 2, and the explanation is omitted. The radio communication equipment 6 of this operation gestalt is the almost same configuration as the radio communication equipment 4 of said operation gestalt, and is equipped with the antenna transfer switch 55 which switches the bidirectional wireless transceiver antenna 86 and the wireless tag transceiver antenna 54 by the communication link with the wireless tag transceiver antenna 54 which receives the signal from sending out and the wireless tag 3 for a signal to the wireless tag 3, and other radio communication equipments 19 or the wireless tag 3.

[0078] A radio communication equipment 6 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0079] The bidirectional radio means of a radio communication equipment 6 transmits a signal to the source 40 of transmission, a modulator 42, the transmitting RF section 43, the antenna changeover switch 55, the transmission-and-reception eliminator 45, and other radio communication equipments 19, and consists of other radio communication equipments 19 including the bidirectional wireless transceiver antenna 86 and the receiving RF section 47 which receive a signal, the recovery section 48, the information signal input section 50, and the recovery signal output part 51.

Moreover, the question means of a radio communication equipment 6 is constituted including the wireless tag transceiver antenna 54 which has the function of a wireless tag receiving antenna receive the signal transmitted from the wireless tag transmitting antenna and the wireless tag 3 which transmit a signal to the source 40 of transmission, a signal distribution box 41, a modulator 42, the transmitting RF section 43, the signal eliminator 44, the antenna changeover switch 55, and the wireless tag 3, the wireless tag demodulator 49, the information signal input section 50, and the tag recovery signal output part 52.

[0080] With the bidirectional radio means and question means which were mentioned above, the source 40 of transmission, the antenna changeover switch 55, etc. are share-sized further. Thus, with a bidirectional radio means and a question means, by using each part in common, simplification and a miniaturization of equipment can be attained and reduction of a manufacturing cost can be aimed at.

[0081] Communication link actuation with other radio communication equipments 19 of a radio communication equipment 6 is in the condition which switched the antenna transfer switch 55 to the bidirectional wireless transceiver antenna 86 side, and since it is carried out like the radio communication equipment 4 of said operation gestalt, it omits explanation.

[0082] RFID actuation of a radio communication equipment 6 is explained below. The question means mentioned above is used for the communication link with the wireless tag 3. The subcarrier sent in the source 40 of transmission passes along the antenna transfer switch 55 switched to the modulator 42, transmitting RF section 43, signal eliminator 44, and wireless tag transceiver antenna 54 side, and is transmitted from

the wireless tag transceiver antenna 54. When reading the information currently written in the wireless tag 3, the subcarrier sent in the source 40 of transmission is modulated in inputting the read-out command information for reading the information on the wireless tag 3 with no becoming irregular or a modulator 42 from the information input section 50. It passes along the antenna changeover switch 55, and is transmitted from the wireless tag transceiver antenna 54, and the signal outputted from a modulator 42 is received by the wireless tag 3. With the wireless tag 3, after receiving the signal transmitted from a radio communication equipment 6, it becomes irregular and sends out by the are recording information which this wireless tag 3 has. It is received by the wireless tag transceiver antenna 54, and the signal sent out from the wireless tag 3 passes along the antenna transfer switch 55 and the signal eliminator 44, and is sent to the wireless tag recovery section 49. The wireless tag recovery section 49 inputs a part of subcarrier from the source 40 of transmission taken out by the signal distribution box 41, and restores to the signal received from the wireless tag 3.

[0083] As mentioned above, a radio communication equipment 6 is equipped with a signal with the wireless tag transceiver antenna 54 which receives the signal from sending out and the wireless tag 3 to the bidirectional wireless transceiver antenna 86 which performs the communication link with other radio communication equipments 19, and the wireless tag 3, by the communication link with other radio communication equipments 19, or the communication link with the wireless tag 3, switches the antenna transfer switch 55 and is considering it as the configuration which uses the bidirectional wireless transceiver antenna 86 and the wireless tag transceiver antenna 54 properly. Therefore, the description of each communication link can be effectively demonstrated by using a separate antenna for the communication link with the communication link with other radio communication equipments 19, and the wireless tag 3.

[0084] In addition, as shown in the local Fig. of drawing 3 (b), in a radio communication equipment 6, the antenna changeover switch 55 and the wireless tag transceiver antenna 54 may be placed between the bidirectional wireless transceiver antenna 86 and the transmission-and-reception part device 45. By this, a radio communication equipment 6 can also perform the communication link with the wireless tag 3, while transmitting to other radio communication equipments 19 depending on communication environment.

[0085] Drawing 4 is drawing showing the radio structure of a system containing the radio communication equipment 7 of the operation gestalt of further others of this

invention. With the radio communication equipment 7 shown in drawing 4, the same sign is given to the part which overlaps the radio communication equipment 4 of said operation gestalt shown in drawing 1, and the explanation is omitted.

[0086] Although the separate demodulator was used for the communication link with other radio communication equipments 19, and the communication link with the wireless tag 3 in the radio communication equipments 4, 5, and 6 of said operation gestalt, the radio communication equipment 7 of this operation gestalt restores to the signal received in the communication link with other radio communication equipments 19 and the wireless tag 3 with one recovery means (multifunctional demodulator 57). Usually, in two-way communication with other radio communication equipments 19, modulation techniques, such as PSK (Pulse Sift Keying) and QPSK (Quadrature Phase Sift Keying), are often used. On the other hand, in the communication link of RFID actuation, modulation techniques, such as simple ASK (Amplitude Sift Keying) or simple PSK, are used. Therefore, as a multifunctional demodulator 57, if the demodulator of PSK, a QPSK synchronous-detection method, or a delay detection system is used, it can be made to serve a double purpose to both communication links.

[0087] A radio communication equipment 7 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0088] The bidirectional radio means of a radio communication equipment 7 is constituted including the signal coupler 56 which combines alternatively with the multifunctional demodulator 57 the signal transmitted from the signal or the wireless tag 3 transmitted from the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transceiver common antenna 46, and other radio communication equipments 19, the receiving RF section 47, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51. Moreover, the question means of a radio communication equipment 7 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the signal eliminator 44, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transceiver common antenna 46, the signal coupler 56, the receiving RF section 47, the multifunctional demodulator 57, the information signal



input section 50, and the recovery signal output part 51.

[0089] Since it is carried out like the radio communication equipment 4 of said operation gestalt in a radio communication equipment 7 where the switch which is the signal coupler 56 is connected to the transmission-and-reception eliminator 45 by the communication mode in communication link actuation with other radio communication equipments 19, explanation is omitted. In addition, as the local Fig. of drawing 3 (b) showed, an antenna changeover switch and a wireless tag transceiver antenna may be placed between bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and the transmission-and-reception eliminator 45.

[0090] Below, RFID actuation of a communication terminal 7 is explained. When performing the communication link with the wireless tag 3, the question means mentioned above is used. The subcarrier sent in the source 40 of transmission is transmitted through a modulator 42, the transmitting RF section 43, the signal eliminator 44, and the transmission-and-reception eliminator 45 from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46. When reading the information currently written in the wireless tag 3, the subcarrier sent in the source 40 of transmission is modulated for the read-out command information for reading the information on the wireless tag 3 with no becoming irregular or a modulator 42. It is transmitted from bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and this signal is received by the wireless tag 3. With the wireless tag 3, after receiving the signal transmitted from a radio communication equipment 7, it becomes irregular and sends out by the are recording information which this wireless tag 3 has. It is received by bidirectional wireless transmission and reception and the wireless tag transceiver common antenna 46, and the signal sent out from the wireless tag 3 is sent to the signal eliminator 44. It is separated by the signal eliminator 44, and the signal received from the wireless tag 3 passes along the signal coupler 56 and the receiving RF section 47, and restores to them with the multifunctional demodulator 57. In a radio communication equipment 7, although RF switch is used as a signal coupler 56, a circulator, a coupler, etc. may be used. Moreover, the switch which is the transceiver eliminator 45 is fixed to a transmitting system side in RFID actuation. The signal to which it restored with the multifunctional demodulator 57 is taken out from the recovery signal output part 51, and the are recording information on the wireless tag 3 is acquired.

[0091] As mentioned above, the source 40 of transmission, the transmission-and-reception eliminator 45, bidirectional wireless transmission and

reception and a wireless tag transceiver common antenna 46, the signal coupler 56, and multifunctional demodulator 57 grade are communalized and used for the bidirectional radio means and question means of a radio communication equipment 7 as radical headquarters. Therefore, simplification and a miniaturization of equipment can be attained and reduction of a manufacturing cost can be aimed at.

[0092] Moreover, it is good also as a multifunctional demodulator 58 which used the synchronous-detection method of a carrier playback mold for the multifunctional demodulator 57 of the radio communication equipment 7 of said operation gestalt with the operation gestalt of further others of this invention. Drawing 5 is drawing showing the configuration of the radio communication equipment 8 of this operation gestalt. With the radio communication equipment 8 shown in drawing 5, the same sign is given to the part which overlaps the radio communication equipments 4 and 7 of said operation gestalt shown in drawing 1 and drawing 4, and the explanation is omitted.

[0093] A radio communication equipment 8 restores to the signal received in the communication link with other radio communication equipments 19 and the wireless tag 3 with the multifunctional demodulator 58 using the synchronous-detection method of a carrier playback mold. Various approaches, such as an approach of making the dispatch wave which carried out phase simulation to the signal which formed the transmitter in the demodulator and was received by the PLL (PhaseLocked Loop) circuit as a demodulator of a synchronous-detection method, and performing a synchronous detection, and a method using the Costas loop formation, are used. Moreover, when using as an interrogator, the source 40 of transmission is used as a carrier for synchronous detections. In a radio communication equipment 8, the subcarrier from the source 40 of transmission is taken out by the signal distribution box 41, and this signal is ~~is~~ to the multifunctional demodulator 58 of a synchronous-detection mold through the source switch 59 of a signal. The signal led to the multifunctional demodulator 58 is used as a carrier for synchronous detections.

[0094] It is good also as a configuration which sends the signal which receives the signal transmitted from the wireless tag 3 without considering as the configuration which sends the signal received from the wireless tag 3 with the operation gestalt of further others of this invention using the signal eliminator 44 like the radio communication equipment 7 of said operation gestalt to the signal coupler 56, which was equipped with wireless tag receiving-antenna 53, and which was received with this wireless tag receiving antenna 53 to the signal coupler 56. Drawing 6 is drawing showing the radio structure of a system containing the radio communication



equipment 9 of this operation gestalt. with the radio communication equipment 9 shown in drawing 6 , the same sign is given to the part which overlaps drawing 2 , drawing 4 , and the radio communication equipments 5 and 7 of said operation gestalt boiled and shown, and the explanation is omitted.

[0095] A radio communication equipment 9 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0096] The bidirectional radio means of a radio communication equipment 9 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76, the signal coupler 56, the receiving RF section 47, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51. Moreover, the question means of a radio communication equipment 9 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the transceiver separation section 45, the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 that function on the wireless tag 3 as wireless tag transmitting antennas which transmit a signal, the wireless tag receiving antenna 53, the signal coupler 56, the receiving RF section 56, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51.

[0097] As radical headquarters, the bidirectional radio means and question means of a radio communication equipment 9 share-size the source 40 of transmission, the transmission-and-reception eliminator 45, bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76, the signal coupler 56, and multifunctional demodulator 57 grade, and they are used for them.

[0098] Since a radio communication equipment 9 is equipped with the wireless tag receiving antenna 53 which receives the signal transmitted from the wireless tag 3, the sending signal to the wireless tag 3 transmits using the bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76 which performs a communication link wide range than the communication link with other radio communication equipments, i.e., the communication link with the wireless tag 3, and receives the signal from the wireless tag 3 using the directive high wireless

tag receiving antenna 53. Thus, the feebleer signal from the wireless tag 3 is receivable by using the directive high wireless tag receiving antenna 53.

[0099] RFID actuation of a radio communication equipment 9 uses the question means mentioned above. The subcarrier sent in the source 40 of transmission is sent out through the transmitting RF section 43, the transmission-and-reception eliminator 45, and bidirectional wireless transmission and reception and a wireless tag transmitting common antenna 76 in no becoming irregular thru/or the condition of having become irregular in part, and results in the wireless tag 3. It is received by the wireless tag receiving antenna 53, and through the signal coupler 56, the signal returned from the wireless tag 3 goes into the multifunctional demodulator 57, it restores to it, and the information on the wireless tag 3 is taken out from the recovery signal output part 51. Although a part of signal returned from the wireless tag 3 is inputted into bidirectional wireless transmission and reception and the wireless tag transmitting common antenna 76, this does not become a problem by devising [ configuration / of the transmitting RF section 43 ]. Communication link actuation with other radio communication equipments 19 does not involve, but since it is the same as that of the radio communication equipment 7 of drawing 4 , especially the wireless tag receiving antenna 53 omits explanation.

[0100] As mentioned above, by using a common part with a bidirectional radio means and a question means, simplification and a miniaturization of equipment can be attained and a manufacturing cost can be reduced.

[0101] It is good also as a multifunctional demodulator 58 which used the synchronous-detection method of a carrier playback mold for the multifunctional demodulator 57 of the radio communication equipment 9 of said operation gestalt with the operation gestalt of further others of this invention. Drawing 7 is drawing showing the configuration of the radio communication equipment 10 of this operation gestalt. With the radio communication equipment 10 of this operation gestalt, the same sign is given to the part which overlaps the radio communication equipments 8 and 9 of said operation gestalt shown in drawing 5 and drawing 6 , and the explanation is omitted. Moreover, since communication link actuation with other radio communication equipments and RFID actuation are the same as that of the radio communication equipment 7 of said operation gestalt fundamentally, the explanation is omitted.

[0102] Drawing 8 is drawing showing the radio structure of a system containing the radio communication equipment 11 of the operation gestalt of further others of this invention. With the radio communication equipment 11 of this operation gestalt, the same sign is given to the part which overlaps the radio communication equipment of

said operation gestalt, and the explanation is omitted. A radio communication equipment 11 is the almost same configuration as the radio communication equipment 7 of said operation gestalt, and is equipped with the signal coupler 60 which switches the bidirectional wireless transceiver antenna 86 and the wireless tag transceiver antenna 54 to the wireless tag 3 by the communication link with the wireless tag transceiver antenna 54 which receives the signal to which a signal is transmitted from transmission and the wireless tag 3, and other radio communication equipments 19 and the wireless tag 3.

[0103] A radio communication equipment 11 can be used as an interrogator in which the communication link with the wireless tag 3 is possible while consisting of a bidirectional radio means to perform bidirectional radio with other radio communication equipments 19, and a question means to perform the communication link with the wireless tag 3 and being able to use as the wireless LAN in which bidirectional radio is possible, or a portable telephone.

[0104] The bidirectional radio means of a radio communication equipment 11 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the signal coupler 60, the transmission-and-reception eliminator 45, the bidirectional wireless transceiver antenna 86, the signal coupler 56, the receiving RF section 47, the multifunctional demodulator 57, the information signal input section 50, and the recovery signal output part 51. Moreover, the question means of a radio communication equipment 11 is constituted including the source 40 of transmission, a modulator 42, the transmitting RF section 43, the signal coupler 60, the transmission-and-reception eliminator 44, the wireless tag transceiver antenna 54, the signal coupler 56, the receiving RF section 47, the multifunctional demodulator 57, the information input section 50, and the recovery signal output part 51.

[0105] The source 40 of transmission, the signal coupler 60, the signal coupler 56, the receiving RF section 47, and multifunctional demodulator 57 grade are communalized and used for the bidirectional radio means and question means of a radio communication equipment 11 as radical headquarters. Simplification and a miniaturization of equipment can be attained by considering as such a configuration, and reduction of a manufacturing cost is possible.

[0106] When performing the communication link with other radio communication equipments, a radio communication equipment 11 connects to the transmission-and-reception eliminator 45 side RF switch which are the signal coupler 60 (this operation gestalt switch) and the signal coupler 56, and communicates using the bidirectional wireless transceiver antenna 86 of an above-mentioned bidirectional

radio means. On the other hand, in RFID actuation, the signal coupler 60 and the signal coupler 56 are connected to the signal eliminator 44, and it is performed using an above-mentioned question means. The subcarrier from the source 40 of transmission is sent out from the wireless tag transceiver antenna 54 via a modulator 42, the transmitting RF section 43, the signal coupler 60, and the signal eliminator 44. It is received by the wireless tag transceiver antenna 54, it is separated by the signal eliminator 44, and restores to the signal from the wireless tag 3 with the multifunctional demodulator 57 via the signal coupler 56 and the receiving RF section 47. Thus, in the case of a communication link, it is switched and used for the antenna suitable for each communication link with other radio communication equipments or the wireless tag 3.

[0107] It is good also as a multifunctional demodulator which used the synchronous-detection method of a carrier playback mold for the multifunctional demodulator 57 of the radio communication equipment 11 of said operation gestalt with the operation gestalt of further others of this invention. Drawing 9 is drawing showing the configuration of the radio communication equipment 12 of this operation gestalt. With the radio communication equipment 12 of this operation gestalt, the same sign is given to the part which overlaps the radio communication equipment of said operation gestalt, and the explanation is omitted. The radio communication equipment 12 of this operation gestalt restores to the signal received in the communication link with other radio communication equipments and a wireless tag with the multifunctional demodulator 58 using the synchronous-detection method of a carrier playback mold. Since communication link actuation with other radio communication equipments and a wireless tag is fundamentally the same, it abbreviates explanation to the radio communication equipment 11 of said operation gestalt.

[0108] Drawing 10 is drawing showing the configuration of the communication system containing the radio communication equipment 13 of the operation gestalt of further others of this invention. The radio communication equipment 13 of this operation gestalt is constituted including the question section 15 which is a question means to perform the communication link with the bidirectional Radio Communications Department 14 and the wireless tag which are the bidirectional radio means which communicates with other radio communication equipments 19.

[0109] Since the bidirectional Radio Communications Department 14 is the same configuration as the conventional bidirectional radio communication equipment 1 shown in drawing 14, it omits the explanation. The bidirectional Radio

Communications Department 14 and the question section 15 can also constitute possible [desorption].

[0110] Drawing 11 is drawing showing the configuration of the question section 15 of a radio communication equipment 13. An interrogator 15 is constituted including the bidirectional wireless receiving antenna 62 which receives directly the signal sent out from the antenna of the bidirectional Radio Communications Department 14, the wireless tag receiving antenna 63 which receives the signal sent out from the wireless tag 3, a demodulator 64, the signal-processing section 65, and the recovery signal output part 66.

[0111] Next, RFID actuation of a radio communication equipment 13 is explained. The bidirectional Radio Communications Department 14 sends a signal from an antenna 24, in order to communicate. Although an antenna 24 is the same antenna as the conventional antenna 24 shown in drawing 14, it transmits the signal to transmission and reception of the signal of 19 with bidirectional radio equipment, transmission of the signal to a wireless tag, and the antenna 63 of a question means. The signal sent from the antenna 24 results also in the wireless tag 3 which exists in a certain distance, and is inputted also into the bidirectional wireless receiving antenna 62 of the question section 15 further arranged near an antenna 24 at near at the same time it is emitted towards other radio machines 19. That magnitude is adjusted by the directive design of the bidirectional wireless receiving antenna 62 although a part of this sending signal results also in the wireless tag receiving antenna 63 of the question section 15. For example, with this operation gestalt, the wireless tag receiving antenna 63 is made into a flat antenna with directivity, and is arranged on the side face of the question section 15.

[0112] The signal inputted into the wireless tag 3 is modulated for the information held in the wireless tag 3, and the modulating signal is emitted from the wireless tag 3. It is received by the wireless tag receiving antenna 63 of the question section 15, and the modulating signal emitted from this wireless tag 3 is inputted into the demodulator 64 which consists of synchronous detectors etc. On the other hand, the signal sent out from the antenna 24 of the bidirectional Radio Communications Department 14 which received with the bidirectional wireless receiving antenna 62 is also inputted into a demodulator 64, a mixed recovery is carried out with the modulating signal from the wireless tag 3, and the modulating signal from the wireless tag 3 restores to the question section 15. The information to which it restored in the demodulator 64 lets the signal-processing machine 65 pass, and is taken out from the recovery signal output part 66. The information taken out from the wireless tag 3 is accumulated in

the signal-processing machine 65, or can also be transmitted to other radio communication equipments 19 by the two-way communication section 14.

[0113] Moreover, when it becomes irregular by simple ASK etc. in the wireless tag 3, the bidirectional wireless receiving antenna 62 is it not being necessarily required, and the wireless tag receiving antenna's 63 receiving the modulating signal from the wireless tag 3, and carrying out AM recovery with a demodulator 64, and can also take out the information on the wireless tag 3.

[0114] Thus, in the radio communication equipment 13 of this operation gestalt, since information is read in the wireless tag 3 using the signal transmitted from the bidirectional Radio Communications Department 24, if the wireless tag 3 is read in case it is simplified sharply and an interrogator performs the communication link with other radio communication equipments 19, it can use an electric wave effectively.

[0115] With the operation gestalt of further others of this invention, a separate antenna may not receive the modulated wave emitted from the signal and the wireless tag 3 from the bidirectional Radio Communications Department 14 like the question section 15 of said operation gestalt shown in drawing 11, but as shown in drawing 12, the same antenna 67 may receive. In this case, since one antenna 67 receives the signal from the bidirectional Radio Communications Department 14, and the modulating signal from the wireless tag 3, both phase contrast cannot be set up freely. Therefore, if these signals have a specific reception relation, since a demodulator 65 is a synchronous-detection method, the Nur point (a recovery output is set to 0 on specific conditions) peculiar to a synchronous detection will produce it. This problem is solvable by using the frequency-hopping method currently indicated by JP,7-131403,A. By considering as such a configuration, simplification and a miniaturization of the question section 16 can be attained.

[0116] Moreover, it is good also as a configuration which prepares two antennas for the bidirectional Radio Communications Department 14 of said operation gestalt shown in drawing 10 with the operation gestalt of further others of this invention. Drawing 13 is an enlarged drawing near [in the bidirectional Radio Communications Department 17 of this operation gestalt] the antenna. The bidirectional Radio Communications Department 17 is the same configuration as the conventional bidirectional radio communication equipment 1, and only the parts of an antenna differ. The bidirectional Radio Communications Department 17 of this operation gestalt has the antenna changeover switch 69 which switches the wireless tag transmitting antenna 68 which sends a signal to the wireless tag 3 other than the antenna 24 which performs the communication link with other radio communication equipments 19, and

an antenna 24 and the wireless tag antenna 68. Communication link sensibility with the wireless tag 3 can be raised to the wireless tag transmitting antenna 68 by using an antenna with high directivity compared with an antenna 24.

[0117] moreover, in the radio communication equipments 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 of each operation gestalt mentioned above Although only the actuation which reads the information accumulated in the wireless tag 3 in the communication link with the wireless tag 3 is described, write-in actuation of the information on the wireless tag 3 Usually, for example, an ASK modulation can be given to the sending signal of a radio communication equipment as it carries out, and it can realize easily by getting over with the wireless tag 3 etc.

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[Translation done.]

**\* NOTICES \***

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2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the radio structure of a system containing the radio communication equipment 4 which is one gestalt of operation of this invention.

[Drawing 2] It is drawing showing the radio structure of a system containing the radio communication equipment 5 which are other operation gestalten of this invention.

[Drawing 3] It is drawing showing the radio structure of a system containing the radio communication equipment 6 which is the operation gestalt of further others of this invention.

[Drawing 4] It is drawing showing the radio structure of a system containing the radio communication equipment 7 which is the operation gestalt of further others of this

invention.

[Drawing 5] It is drawing showing the configuration of the radio communication equipment 8 which is the operation gestalt of further others of this invention.

[Drawing 6] It is drawing showing the radio structure of a system containing the radio communication equipment 9 which is the operation gestalt of further others of this invention.

[Drawing 7] It is drawing showing the configuration of the radio communication equipment 10 which is the operation gestalt of further others of this invention.

[Drawing 8] It is drawing showing the radio structure of a system containing the radio communication equipment 11 which is the operation gestalt of further others of this invention.

[Drawing 9] It is drawing showing the configuration of the radio communication equipment 12 which is the operation gestalt of further others of this invention.

[Drawing 10] It is drawing showing the radio structure of a system containing the radio communication equipment 13 which is the operation gestalt of further others of this invention.

[Drawing 11] It is drawing showing the example of a configuration of the question section 15 of the radio communication equipment 13 of drawing 10.

[Drawing 12] It is drawing showing the example of a configuration of the question section 16 of the radio communication equipment 13 of drawing 10.

[Drawing 13] It is an enlarged drawing near the antenna of the bidirectional Radio Communications Department 17 of the operation gestalt of further others of this invention.

[Drawing 14] It is drawing showing the basic configuration of the conventional bidirectional radio communication equipment 1.

[Drawing 15] It is drawing showing the interrogator 2 and the wireless tag 3 of a common RFID system.

[Description of Notations]

3 Wireless Tag

4, 5, 6, 7, 8, 9, 10, 11, 12, 13 Radio communication equipment

14 17 Bidirectional Radio Communications Department

15 16 Question section

19 Other Radio Communication Equipments

24 Antenna

40 Source of Transmission

42 Modulator

- 44 Signal Eliminator  
 46 Bidirectional Wireless Transmission and Reception and Wireless Tag Transceiver  
 Common Antenna  
 48 Demodulator  
 49 Wireless Tag Demodulator  
 53 Wireless Tag Receiving Antenna  
 54 Wireless Tag Transceiver Antenna  
 57 Multifunctional Demodulator  
 62 Bidirectional Wireless Receiving Antenna  
 63 Wireless Tag Receiving Antenna  
 64 Demodulator  
 65 Signal-Processing Section  
 68 Wireless Tag Antenna  
 76 Bidirectional Wireless Transmission and Reception and Wireless Tag Transmitting  
 Common Antenna  
 86 Bidirectional Wireless Transceiver Antenna

[Translation done.]

**\* NOTICES \***

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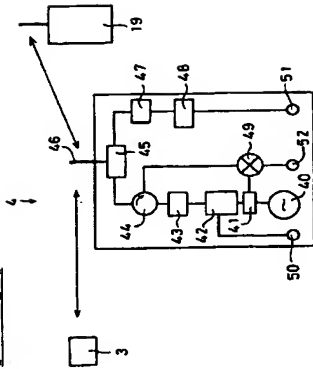
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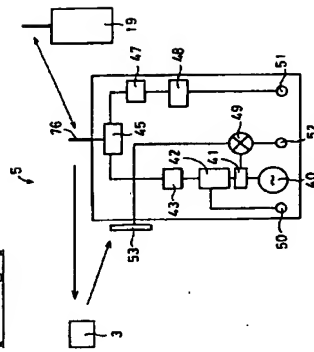
3. In the drawings, any words are not translated.

**DRAWINGS**

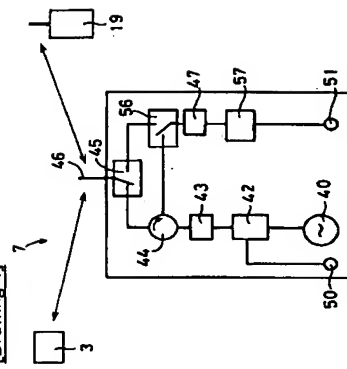
[Drawing 1]



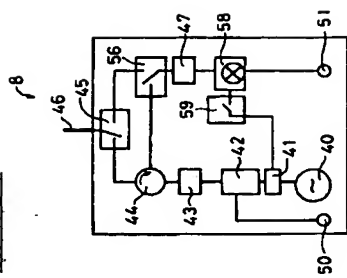
[Drawing 2]



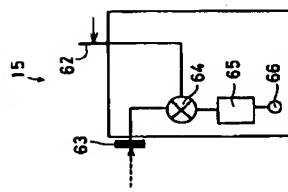
[Drawing 4]



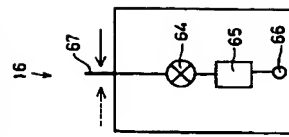
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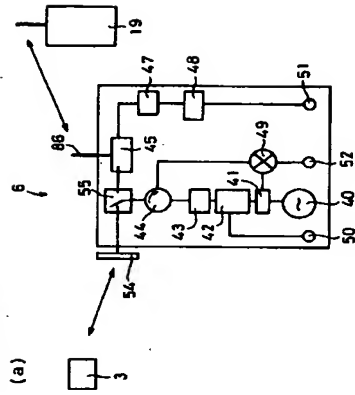
[Drawing 11]



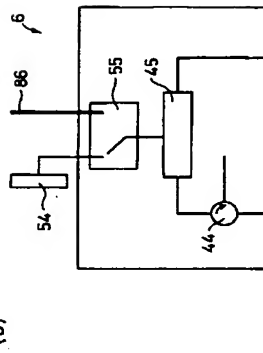
[Drawing 12]



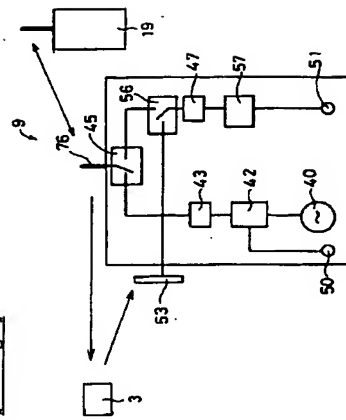
[Drawing 3]



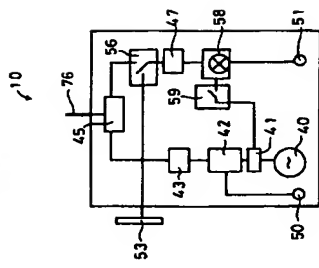
(b)



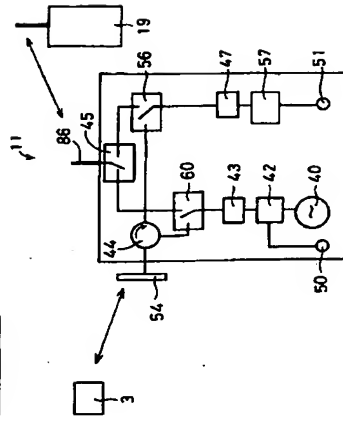
[Drawing 6]



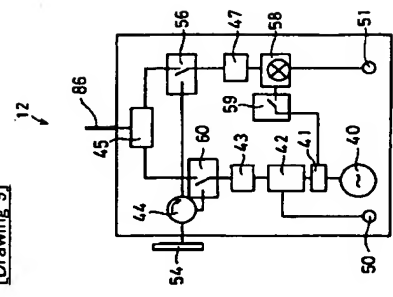
[Drawing 7]



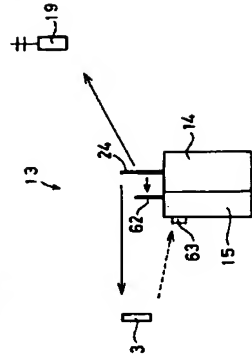
[Drawing 8]



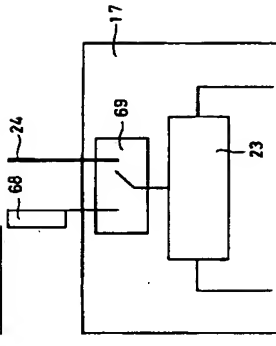
[Drawing 9]



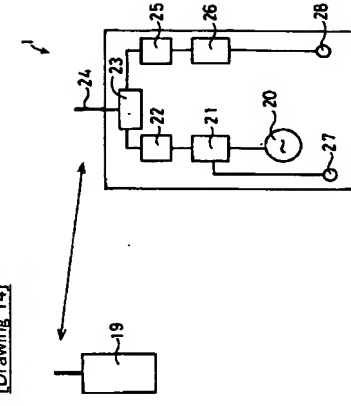
[Drawing 10]



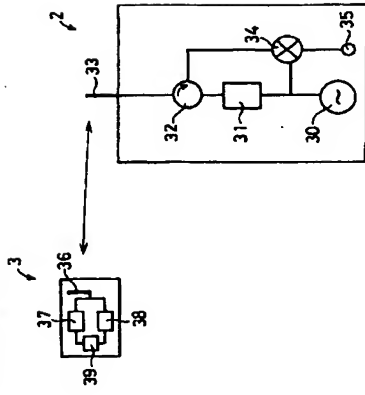
[Drawing 13]



[Drawing 14]



[Drawing 15]



[Translation done.]



方向無線送受信アンテナと、他の無線通信装置から受信した信号を復調する復調手段とを備え、

前記復調手段は、前記双方無線通信手段の送信波で発信する搬送波を用いて無線タグに信号を送信する無線タグ送信アンテナと、無線タグから送信される信号を受信する無線タグ受信アンテナとを備え、無線タグから送信される信号を前記双方無線通信手段の復調手段で復調することを特徴とする請求項1記載の無線通信装置。

【請求項10】 他の無線通信装置から送信される信号または無線タグから送信される信号を選択的に復調器に結合する信号結合部を備えることを特徴とする請求項9記載の無線通信装置。

【請求項11】 前記双方無線通信手段の双方無線送受信アンテナと復調手段の無線タグ送信アンテナとは、共通のアンテナであることを特徴とする請求項8～10のいずれか1つに記載の無線通信装置。

【請求項12】 送信波からの信号をアンテナに送り、アンテナで受信した無線タグから送信される信号を、該信号を復調する復調手段に送る信号分離部を備えることを特徴とする請求項8～11のいずれか1つに記載の無線通信装置。

【請求項13】 他の無線通信装置への送信信号と、他の無線通信装置からの受信信号を分離する送受信分離部が設けられることを特徴とする請求項8～12のいずれか1つに記載の無線通信装置。

【請求項14】 送信波で発信した搬送波の一部を用いて、無線タグから送信される信号を復調することを特徴とする請求項1～13のいずれか1つに記載の無線通信装置。

【請求項15】 前記送信波は双方無線通信手段に設けられ、前記双方無線通信手段は、無線タグへ信号を送信するアンテナを有することを特徴とする請求項2記載の無線通信装置。

【請求項16】 双方無線通信手段の行う他の無線通信装置への信号の送受信と、無線タグへの信号の送受信と、共通のアンテナによって行われることを特徴とする請求項15記載の無線通信装置。

【請求項17】 双方無線通信手段の行う他の無線通信装置への信号の送受信と、無線タグへの信号の送受信と、別々のアンテナによって行われることを特徴とする請求項16記載の無線通信装置。

【請求項18】 復調手段は、無線タグで情報に基づいて変調された信号および双方無線通信手段から送信された信号を受信するアンテナを備えることを特徴とする請求項15～18のいずれか1つに記載の無線通信装置。

【請求項19】 復調手段は、無線タグで情報に基づいて変調された信号を受信するアンテナと、双方無線通信手段から送信された信号を受信するアンテナとを別々に設ける。

#### 【特許請求の範囲】

【請求項1】 送信波から発信される搬送波を変調して、アンテナから他の無線通信装置に送信し、他の無線通信装置からの信号をアンテナで受信し、復調する双方無線通信手段と、

送信波から発信される搬送波を変調または無変調でアンテナから無線タグに信号を送信し、該信号に基づき、搬送される情報に基づいて変調して無線タグから送信される信号をアンテナで受信し、復調して無線タグに記憶される情報を読み出す復調手段とを備えることを特徴とする無線通信装置。

【請求項2】 前記双方無線通信手段の搬送波を発信する送信部と、復調手段の搬送波を受信する受信部とは、共通であることを特徴とする請求項1記載の無線通信装置。

【請求項3】 前記双方無線通信手段のアンテナと、前記復調手段のアンテナとは、共通であることを特徴とする請求項1または2記載の無線通信装置。

【請求項4】 前記双方無線通信手段のアンテナと、前記復調手段のアンテナとはそれぞれ別々に設けられることを特徴とする請求項1または2記載の無線通信装置。

【請求項5】 前記双方無線通信手段のアンテナと、前記復調手段の無線タグに送信するアンテナとは、共通であることを特徴とする請求項1または2記載の無線通信装置。

【請求項6】 前記双方無線通信手段の搬送波の変調と、前記復調手段の搬送波の変調とは、共通の変調手段で変調することを特徴とする請求項1～5のいずれか1つに記載の無線通信装置。

【請求項7】 他の無線通信装置から送信される信号の復調と、無線タグから送信される信号の復調とは、共通の復調手段で復調されることを特徴とする請求項1～6のいずれか1つに記載の無線通信装置。

【請求項8】 前記双方無線通信手段は、搬送波を発信する送信部と、前記送信部で発信した搬送波を受調する変調手段と、前記変調手段からの信号を他の無線通信装置へ送信し、他の無線通信装置からの信号を受信する双方無線送受信アンテナと、他の無線通信装置から受信した信号を復調する復調手段とを備え、

前記復調手段は、前記双方無線通信手段の送信波で発信する搬送波を用いて無線タグに信号を送信する無線タグ送信アンテナと、無線タグから送信される信号を受信する無線タグ受信アンテナと、無線タグ受信アンテナで受信した信号を復調する無線タグ復調手段とを備えることを特徴とする請求項1記載の無線通信装置。

【請求項9】 前記双方無線通信手段は、搬送波を発信する送信部と、前記送信部で発信した搬送波を受調する変調手段と、前記変調手段からの信号を他の無線通信装置へ送信し、他の無線通信装置から信号を受信する双方無線送受信アンテナと、他の無線通信装置から信号を受信する双方無線送受信アンテナとを備える。

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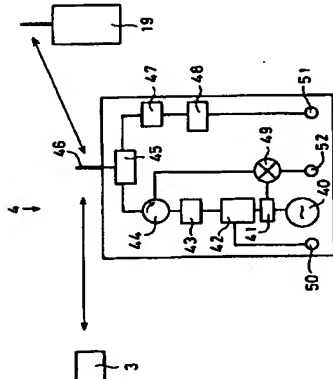
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(54) 【発明の名称】 無線通信装置および無線通信システム

(57) 【要約】

【課題】 簡単な構成でRFIDシステムにおける質問と無線LANや携帯電話など本格的な双方無線通信装置を融合させた無線通信装置およびこの無線通信装置を用いた無線通信システムを提供する。

【解決手段】 無線通信装置4は、他の無線通信装置19および無線タグ3との通信が可能である。他の無線通信装置19または無線タグ3との通信を行う際には、それぞれ共通の送信部40、変調器42、送信RF部44、送受信分離器45および双方無線通信装置48、無線通信装置19から受信した信号は復調器49で復調される。このような構成とすることによって、他の無線通信装置19および無線タグ3と通信を1台の装置で行うことができる。より低価格で、小型に装置を構築することができる。



に備えることを特徴とする請求項 15～18 のいずれか 1 つに記述の無線通信装置。

【請求項 20】 前記双方向無線通信手段は、搬送波を発信する送信機と、前記送信機で発信した搬送波を受信する受信機と、前記受信機からの信号を他の無線通信装置へ送信し、他の無線通信装置から信号を受信する双方向受信アンテナと、他の無線通信装置から受信した信号を受信する復調手段とを備え、

前記復調手段は、前記双方向無線通信手段の双方向受信アンテナから送信される信号を受信する双方向無線受信アンテナと、無線タグから送信される信号を受信する無線タグ受信アンテナと、これらのアンテナで受信した信号を混合復調する復調手段とを備えることを特徴とする請求項 2 記載の無線通信装置。

【請求項 21】 前記復調手段の双方向無線受信アンテナと、無線タグ受信アンテナとは、共通であることを特徴とする請求項 20 記載の無線通信装置。

【請求項 22】 請求項 1～21 のいずれか 1 つに記載の無線通信装置と、

無線タグとから構成されることを特徴とする無線通信システム。

【請求項 23】 前記無線タグには情報が書き込み可能であり、無線通信装置は無線で無線タグに情報を書き込み可能であることを特徴とする請求項 2 記載の無線通信システム。

【発明の詳細な説明】

【発明の属する技術分野】 本発明は、RFID 機能と双方向無線通信機能とを有する無線通信装置および無線通信システムに関する。

【0002】

【従来の技術】 従来、無線を用いた通信装置がある。図 14 は、無線 LAN (Local Area Network) や携帯電話機などの一般的な双方向無線通信装置 1 の基本構成を示す図である。図 14 には、双方向無線通信装置 1 と双向向の無線通信を行う他の無線通信装置 19 も示している。他の無線通信装置 19 は、双方向無線通信装置 1 が通信する他の双方向無線通信装置や無線基地局である。【0003】 双方向無線通信装置 1 は、送信機 20、変調器 21、パワーアンプやフィルタなどからなる送信 RF (Radio Frequency) 部 22、他の無線通信装置 19 へ送信する信号と、無線通信装置 19 から送信される信号とを分離するスイッチまたはダイプレクサなどの送受信分離器 23、信号の送受信および受信するアンテナ 24、低雑音アンプやフィルタなどからなる受信 RF 部 25、受信した信号を復調する復調器 26、他の無線通信装置 19 へ送信するデータなどを入力する情報信号入力部 27、およびデータなどを取り出す復調信号出力部 28 などを含む構成される。双方向無線通信装置 1 では他に、情報信号入力部 27 から変調器 21 に入力するデータを

処理する信号処理部や、送信する信号の周波数を変更するフリクエンシーホッピングを行う場合には、送信機 20 で発信する搬送波の周波数を変えるためのシンセサイザ制御部などが必要であるが図 14 では省略する。送受信分離器 23 は、TDD (Time Division Duplex) または FDD (Frequency Division Duplex) 方式によって、スイッチまたはダイプレクサを使い分ける。

【0004】 図 14 の双方向無線通信装置 1 は、TDD 方式の通信装置として、以下に動作を説明する。双方向無線通信装置 1 の送信機 20 で発信する搬送波は、情報信号入力部 27 から入力された情報信号によって変調器 21 で変調される。変調器 21 で変調された変調信号は、送信 RF 部 22、送受信分離器 (スイッチ) 23 を介してアンテナ 24 から他の無線通信装置 19 に向かって送信される。一方、他の無線通信装置 19 から双方向無線通信装置 1 に送信される変調信号は、アンテナ 24 で受信し、送受信分離器 23 および受信 RF 部 25 を経由して復調器 26 で復調され、復調信号出力部 28 から情報信号が取り出される。以上の双方向無線通信装置 1 の動作は、一般的な双方向無線通信の動作である。

【0005】 図 15 は、一般的な RFID システムの質問器 2 および無線タグ 3 を示す図である。質問器 2 は無線を用いた通信装置であり、送信機 30、変調器 31、サーキュレータや方向性結合器などからなる信号分離器 32、アンテナ 33、同調検波器などからなる復調器 34、およびタグ情報復調信号出力部 35 などを含む構成される。他に、RF 送信機、RF 受信機、信号処理部および無線タグ 3 への送信データを入力する情報信号入力部などが必要であるが図 15 では省略している。無線タグ 3 は、質問器 2 からの信号を受信し、また質問器 2 に信号を送信するタグアンテナ 36、質問器 2 に送信する信号を受調するタグ変調器 37、タグアンテナ 36 で受信するメモリ 39 などを含む構成される。

【0006】 以下に、質問器 2 および無線タグ 3 の動作について説明する。質問器 2 によって、無線タグ 3 の情報を読み出す場合、質問器 2 の送信機 30 で発信する搬送波は変調器 31 で変調され、信号分離器 32 を介してアンテナ 33 から送信される。アンテナ 33 から送信される変調信号は、無線タグ 3 のタグアンテナ 36 で受信され、無線タグ 3 のタグ変調器 37 でメモリ 39 の格納情報によって変調を受け、無線タグ 3 で変調された情報は、無線タグ 3 から質問器 2 に送信される。質問器 2 は、アンテナ 33 で無線タグ 3 から送信される信号を受信する。アンテナ 33 で受信した変調信号は、信号分離器 32 を介して復調器 34 に入力され、復調器 34 で復調された後にタグ情報復調信号出力部 35 から取り出される。無線タグ 3 に情報を書き込む場合には、書き込み情報によって変調器 31 で送信機 30 で発信する搬送波を変調して無線タグ 3 に送信し、無線タグ 3 では受信し

た変調信号をタグ復調器 38 で復調してメモリ 39 に書き込む。以上の質問器 2 および無線タグ 3 の動作は、一般的により知られた RFID システムの動作である。

【0007】 従来から、RFID システムは FA (Factory Automation) 業務などにおいて活用されている。近年、無線タグの小型化やバッテリーレス化によって物流や流通分野で、在庫管理や品物を区分するピッキングシステムなどに幅広く利用されつつある。このような物流や流通分野では、質問器で取得した無線タグの情報は、質問器とは別に格納された無線 LAN などの双方向無線通信装置を用い、即座にアクセスポイントに送られ、管理処理部で処理し、物品を管理する形態がしばしば構成される。また無線タグへ情報を書き込む場合も、管理処理部からの指示によって質問器を用いて行われる。

【0008】

【発明が解決しようとする課題】 上述した従来の双方向無線通信装置 1 は、他の双方向無線通信装置と通信を行う機能を有しているが、無線タグとの通信を行う機能を有していない。また、従来の RFID システムの質問器 2 は、無線タグ 3 との通信を行う機能を有しているが、たとえば、携帯電話機のような能動的な双方向無線通信機能を有していない。

【0009】 また、従来の RFID システムを利用したピッキングシステムなどでは、無線 LAN などの双方向無線通信装置と RFID システムの質問器とは、両者が送信機を持つ独立した装置であるので、装置が大きくなり、コストがかかる。

【0010】 今後は、携帯電話機や Bluetooth などのモバイル無線通信の高速化と連動し、宅業務や郵便配達業務などでの RFID システムの活用が極めて有効になる。このため、特にモバイル環境での利用においては、装置が簡略化および小型化され、低価格で RFID システムの活用が可能な無線通信装置が望まれている。さらに、広域通信も可能な双方向無線通信機能と RFID システムの質問器の機能が一体となった無線通信装置が望まれている。

【0011】 本発明の目的は、簡便な構成で RFID システムにおける質問器と無線 LAN や携帯電話など本格的な双方向無線通信装置を融合させた無線通信装置およびこの無線通信装置を用いた無線通信システムを提供することである。

【0012】 また本発明の他の目的は、他の無線通信装置への送信信号を利用して無線タグとの通信を行う無線通信装置および無線通信システムを提供することである。

【0013】

【課題を解決するための手段】 本発明は、送信機から発信される搬送波を受調して、アンテナから他の無線通信装置に送信し、他の無線通信装置からの信号をアンテナで受信し、復調する双方向無線通信手段と、送信機から

発信される搬送波を受調または無変調でアンテナから無線タグに信号を送信し、該信号に答答し、記憶される情報に基づいて変調して無線タグから送信される信号をアンテナで受信し、復調して無線タグに記憶される情報を検み出す質問手段とを備えることを特徴とする無線通信装置である。

【0014】 本発明に従えば、双方向無線通信手段によって他の無線通信装置との通信を行うことができ、また質問手段によって無線タグとの通信を行うことができ、質問手段によって無線タグとの通信と、他の無線通信装置との通信とを、個別に独立した 2 つの装置を用いる必要がない。

【0015】 また本発明は、前記双方向無線通信手段の搬送波を受信する送信機と、質問手段の搬送波を発信する送信機とは、共通であることを特徴とする。

【0016】 本発明に従えば、双方向無線通信手段の送信機と、質問器の送信機とを共通化し、他の無線通信装置との通信および無線タグとの通信とを一つの送信機から発信させた搬送波を用いて行うので、装置の簡略化および小型化を図ることができ、また製造コストの低減を図ることができる。

【0017】 また本発明は、前記双方向無線通信手段のアンテナと、前記質問手段のアンテナとは、共通であることを特徴とする。

【0018】 本発明に従えば、1 つのアンテナで他の無線通信装置および無線タグとの通信を行う。したがって、装置の簡略化および小型化を図ることができ、また製造コストの低減を図ることができる。

【0019】 また本発明は、前記双方向無線通信手段のアンテナと、前記質問手段のアンテナとはそれぞれ別々に設けられることを特徴とする。

【0020】 本発明に従えば、他の無線通信装置と双向向無線通信を行うアンテナと、無線タグとの通信を行うアンテナとの 2 つのアンテナを備えるので、他の無線通信装置および無線タグとの通信にそれぞれ適したアンテナを用いて、それぞれの通信を行うことができる。

【0021】 また本発明は、前記双方向無線通信手段のアンテナと、前記質問手段の無線タグに送信するアンテナとは、共通であることを特徴とする。

【0022】 本発明によれば、無線タグに信号を送信する場合、より広域な通信を行う双方向無線通信手段のアンテナを用いることができ、装置の簡略化および小型化を図ることができ、無線タグとの通信範囲が広くなる。また、他の無線通信装置への通信を行うと同時に、その送信信号を用いて無線タグに信号を送信することによって、電波を有効に利用することができる。

【0023】 また本発明は、前記双方向無線通信手段の搬送波の変調と、前記質問手段の搬送波の変調とは、共通の変調手段で変調することを特徴とする。

【0024】 本発明に従えば、他の無線通信装置に送信

する信号および無線タグへ送信する信号の変調を共通の変調器で行う。したがって、装置の簡略化および小型化を図ることができる。

【0031】また本発明は、他の無線通信装置から送信される信号または無線タグから送信される信号を選択的に復調器に結合する信号結合部を備えることを特徴とする。

【0032】本発明に従えば、信号結合部によって他の無線通信装置から送信される信号と、無線タグから送信される信号とを選択的に復調器に結合するので、前記2つの信号を同時に1つの復調器に入力することがない。したがって、1つの復調器で前記2つの信号を復調することが可能である。

【0033】また本発明は、前記双方向無線通信手段の双方向無線送受信アンテナと質問手段の無線タグ送信アンテナとは、共通のアンテナであることを特徴とする。

【0034】本発明に従えば、他の無線通信装置との通信と、無線タグへの信号の送信とに同じアンテナを用いるので、装置の簡略化および小型化を図ることができる。無線タグに信号を送信する場合、より正確な通信を行う双方向無線通信手段のアンテナを用いることができ、無線タグとの通信範囲が広がる。

【0035】また本発明は、送信源からの信号をアンテナに送り、アンテナで受信した無線タグから送信される信号を、該信号を復調する復調手段に送る信号分離部を備えることを特徴とする。

【0036】本発明に従えば、信号分離部によって、無線タグへの送信する信号と、無線タグから受信する信号とを分離することができるので、同一のアンテナで無線タグへの信号の送信および無線タグからの信号の受信を行うことができる。

【0037】また本発明は、他の無線通信装置への送信信号と、他の無線通信装置からの受信信号を分離する送受信分離部が設けられることを特徴とする。

【0038】本発明に従えば、たとえばダイプレクサやスイッチなどの送受信分離部を備えるので、TDD (Time Division Duplex) 方式やFDD (Frequency Division Duplex) 方式で他の無線通信装置との双方向無線通信を行うことができる。

【0039】また本発明は、送信源で発信した搬送波の一部を用いて、無線タグから送信される信号を復調することを特徴とする。

【0040】本発明に従えば、たとえば信号分配器などを用いて送信源で発信した搬送波の一部を取り出し、この搬送波を用いて無線タグから送信される信号を復調するので、同期検波のための発信源を別に作らなくても同期検波を行うことができる。

【0041】また本発明は、前記送信源は双方向無線通信手段に設けられ、前記双方向無線通信手段は、無線タグへ信号を送信するアンテナを有することを特徴とする。

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【0042】本発明に従えば、双方向無線通信手段が送信源を有し、質問手段は送信源を持たなくても、前記双方向無線通信手段の送信源から発信される信号をアンテナから無線タグ送信することによって、無線タグの情報を受信することができ、さらに、無線タグへの信号の送信および他の無線通信装置へのデータなどの送信の動作を1つの送信信号エネルギーによって同時に行わせることができる。

【0043】また本発明は、双方向無線通信手段の行う他の無線通信装置への信号の送受信と、無線タグへの信号の送信とは、共通のアンテナによって行われることを特徴とする。

【0044】本発明に従えば、双方向無線通信手段の他の無線通信手段との通信および無線タグへの信号の送信を同じアンテナで行うので、装置の簡略化および小型化を図ることができる。

【0045】また本発明は、双方向無線通信手段の行う他の無線通信装置への信号の送受信と、無線タグへの信号の送信とは、別々のアンテナによって行われることを特徴とする。

【0046】本発明に従えば、他の無線通信装置への信号の送受信と、無線タグへの信号の受信とは別々のアンテナで行うので、それぞれに通信に適したアンテナを用いることができる。

【0047】また本発明は、質問手段は、無線タグで情報に基づいて変調された信号および双方向無線通信手段から送信された信号を受信するアンテナを備えることを特徴とする。

【0048】本発明に従えば、無線タグからの信号と、双方向無線通信手段からの信号を同じアンテナで受信し、信号を復調するので、装置の簡略化および小型化を図ることができる。

【0049】また本発明は、質問手段は、無線タグで情報に基づいて変調された信号を受信するアンテナと、双方向無線通信手段から送信された信号を受信するアンテナとを別々に備えることを特徴とする。

【0050】本発明に従えば、質問手段は無線タグからの信号と、双方向無線通信手段からの信号を別々のアンテナで受信するので、それぞれの信号の受信に適したアンテナを用いて信号を受信して復調することができる。

【0051】また本発明は、前記送信源で発信した搬送波を受信する送信源と、前記送信源で発信した搬送波を受調する変調手段と、前記変調手段からの信号を他の無線通信装置へ送信し、他の無線通信装置から信号を受信する双方向送受信アンテナと、他の無線通信装置から受信した信号を復調する復調手段とを備え、前記質問手段は、前記双方向無線通信手段の双方向送受信アンテナから送信される信号を受信する双方向送受信アンテナと、無線タグから送信される信号を受信する無線タグ受信アンテナと、これらのアンテナで受信した信号

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を混合復調する復調手段を備えることを特徴とする。

【0052】本発明に従えば、双方向無線通信手段のアンテナから送信される信号を双方向無線受信アンテナで受信し、無線タグから送信される信号を無線タグ受信アンテナで受信して、双方向無線通信手段から送信される信号と無線タグから送信される信号とを混合して復調手段するで、質問手段は送信源を備えなくても無線タグから送信される信号の同期検波を行うことができる。

【0053】また本発明は、前記質問手段の双方向無線受信アンテナと、無線タグ受信アンテナとは、共通であることを特徴とする。

【0054】本発明に従えば、質問手段の双方向無線通信手段から送信される信号と無線タグから送信される信号とを同一のアンテナで受信するので、装置の簡略化および小型化を図ることができる。

【0055】また本発明は、前記無線通信装置と、無線タグとから構成されることを特徴とする無線通信システムである。

【0056】本発明に従えば、前記無線通信装置と無線タグとからなる無線通信システムを構成することができ、たとえば、質問手段によって無線タグから受信した情報を双方向無線通信手段によって無線タグの情報を管理する管理装置などに即座に情報を送信することができ、また、無線通信装置は無線によって他の無線通信装置および無線タグとの通信を行うので、設置などの制約がない。

【0057】また本発明は、前記無線タグには情報を書き込み可能であり、無線通信装置は無線で無線タグに情報を書き込み可能であることを特徴とする。

【0058】本発明に従えば、前記無線通信装置によって無線タグに情報を書き込むことができる。したがって、たとえば無線タグの情報を管理する管理装置などから情報を無線通信装置に送信し、無線通信装置から無線タグに情報を送信して無線タグの情報を書き込むことができ、無線タグの管理を的確に行うことができる。

【0059】

【発明の実施の形態】図1は、本発明の実施の一形態である無線通信装置4を含む無線通信システムの構成を示す図である。図1に示す無線通信システムは、無線通信装置4の他に、無線タグ3および無線通信装置4が双方向無線通信を行う他の無線通信装置19などから構成される。なお、図1に示す無線タグ3および他の無線通信装置19は、図14および図15に示した無線タグ3および他の無線通信装置19と同じであるので、同一の符号を付し、その説明を省略する。また、本実施形態に限らず、本発明の各実施形態の無線通信システムは、前記無線タグ3および他の無線通信装置19を含み構成される。無線タグ3は、無線によってメモリに情報を書き込み可能である。

【0060】無線通信装置4は、他の無線通信装置19

送波の周波数は固定されてもよい、また、周波数を変更しながら通信を行うフリケンションホッピングを行う場合、送信機40で発信する周波数を変換する周波数可変機能と皆つように構成してもよい。また、図1では、送受信器45にスイッチを用いた場合にこのスイッチを切り変えるための制御部、情報信号入力部50に入力される信号を処理する信号処理部、復調信号出力部51および信号出力部52から出力される信号を処理する信号復調部などは省略している。

10 【0065】次に、無線通信装置19の動作について説明する。まず、他の無線通信装置19との双方向無線通信を行う場合について説明する。他の無線通信装置19との通信を行う場合は、上述した双方向無線通信手段を用いる。他の無線通信装置19に信号を送信する場合、送信部40で発信された搬送波は情報信号入力部50から入力された情報に基づいて変調され、変調される。変調器12で変調された変調信号は、送信RF部43、信  
20 号分離器44、そして送受分岐器45を經由して双方向無線送受信、無線タグ送受信共通アンテナ46から送信される。この信号は対応する他の無線通信装置19に送られる。本実施形態では、他の無線通信装置19との通信にTDD (Time Division Duplex) 通信を用いることとして、送受分岐器45にスイッチを使用する。一方、他の無線通信装置19から送信される信号を受信する場  
合、他の無線通信装置19から送信される信号は双方向無線送受信、無線タグ送受信共通アンテナ46で受信さ  
れ、受信RF47側に切り換えられ送受分岐器（スイ  
8 ッチ）45を經由し、受信RF部47を通過し、復調器48で復調される。復調器48で復調された情報信号は、  
30 復調信号出力部51から取り出される。

【0066】次に、無線通信装置4をRFIDシステムの変調器として動作させる場合（以下、RFID動作と呼称する）について説明する。無線タグ3との通信を行う場合は、上述した質問手段を用いる。まず、送信器4-1で発信した搬送波は、変調器4-2、送信RF部4-3、信号増幅器4-4、送受分離器4-5を通過し双方向無線通信・無線タグ3は受信アンテナ4-6から無線タグ3に送出される。本実施形態では無線タグ3との通信においての変調器は、他の無線通信装置19との通信で用いられる変調器4-2で行っているが、他の無線通信装置19と無線タグ3との通信方式に違いがある場合には、より最適な変調器を別に設けてもよい。また、送信RF部4-3

も最速な形に分けてもよい。他の無線通信装置192との通信に用いる変調器と無線タグ3との通信を行う変調器とを別々に配ける場合には、情報信号入力部50を2系統設け、それぞれの変調器に情報信号を入力する。

【0067】無線タグ3に書き込まれている情報を読み出す場合は、送信線40で発信した搬送波は無変調かあるいは変調器42で無線タグ3の情報を読み出すための送出コマンド情報で変調される。この信号は双方向無

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線送受信・無線タグ送受信共同アンテナ46から送信され、無線タグ3で受信される。無線タグ3では、無線通信装置4から送信されてくる信号を受信した後、この無線タグ3が有する蓄積情報で変調して送信する。無線タグ3から送信された信号は双方に無線送受信・無線タグ送受信共同アンテナ46で受信され、送受分岐器45で分離される。RFID動作の場合、送受分岐器8であるスイッチは信号分岐器44側、つまり変調器42のある送信系側に固定され、あるいは、上述した双方向無線通信の送信時でのスイッチの状態で行う。この構成により、他の無線通信装置19への送信時にRFID動作を行うことも可能である。

【0068】無線タグ3から折り返して送信された信号は、信号分置器4 4で分離された後、無線タグ復調器4 9に送られる。無線タグ復調器4 9は、信号分置器4 1で取り出された送信波4 0からの搬送波の一部を入力して、無線タグ3から送信された信号を復調する同相検波型の復調器である。また、無線タグ3 2の同相検波に用いる信号は、変調器4 2の出力側に信号分置器4 1を配置して取り出したものを用いてもよい。また、本実施形態の無線タグ復調器4 9は、同相検波型の復調器であるが、無線タグ復調器4 9は単立した復調器であってもよい。無線タグ復調器4 9で復調された信号は、タグ復調信号出力部5 2から取り出される。

【0069】以上のように、本実施形態の無線通信装置4では、他の無線通信装置19との通信を行う双方向無線通信手段と無線タグ3との通信を行う質問手段と、送信タグ40、送受分體器45、双方向無線送受信・無線タグ送受信共同アンテナ46等を共有している。このように、それぞれの部分を共通して使用することによって、装置の簡略化および小型化を図ることができ、また製造コストも抑えられる。また、本実施形態の無線通信機4では、TDD (Time Division Duplex) 通信を行うものとして、送受分體器45をスイッチしたものが、D通信を行う場合には送受分體器としてダイアレクサを用い、また、無線通信装置4を、たとえば双方向無線通信手段をベースにして構成する場合、この双方向無線通信手段に信号分體器44、無線タグ復調器49およびタグ復調信号出力部52を備える簡単な構成で、他の無線通信装置19との通信だけでなく、無線タグ3との通信を行うことが可能となる。

【0070】図2は、本発明の他の実施形態である無線通信装置5を含む無線通信システムの構成を示す図である。図2に示す無線通信装置5で、図1に示した実施形態の無線通信装置4と重複する部分に同一の符号を付し、その説明を省略する。無線通信装置5は、前記実施形態の無線通信装置4とはほぼ同様に構成されており、信号処理部は備えないが、更に無線タグが送信される信号を受信する無線タグ受信アンテナ5-3を備える。

との双方方向無線通信を行う双方方向無線通信手段と、無線タグ3との通信を行う質問手段とから構成され、双方方向無線通信が可能な無線LANあるいは携帯電話機として用いることができることともに、無線タグ3との通信が可能な質問器として用いることができる。

【0072】無線通信装置5の双方向無線通信手段は、送信側40、変調器42、送信RF部43、送受分機器45、他の無線通信装置19に信号を送信し、他の無線通信装置19から信号を受信する双方向無線送受信アンテナとして機能する双方向無線送受信・無線タグ送受信アンテナ76、信号を送信する無線タグ送受信アンテナ76、受信RF部47、復調器48、情報信号処理部50および復調信号出力部51を含む構成され、他の無線通信手段5の質問信号は、送信側40、信号分配器41、変調器42、送信RF部43、送受分機器45、双方向無線送受信・無線タグ送受信アンテナ76、無線タグ3から送信される信号を受信する無線タグ受受信アンテナ53、無線タグ復調器49、情報信号処理部50およびタグ復調信号出力部52を含む構成される。

[illegible]

【0074】無線通信装置5において他の無線通信装置1、19との通信動作は前記実施形態の無線通信装置4と同様であるので、説明を省略する。

[illegible]





成としてもよい。図6は、本実施形態の無線通信装置9を含む無線通信システムの構成を示す図である。図6に示す無線通信装置9で、図2および図4および図1に示す前記実施形態の無線通信装置5および7と重複する部分には同一の符号を付し、その説明を省略する。

【0095】無線通信装置9は、他の無線通信装置19との双方向無線通信を行う双方向無線通信手段と、無線タグ3との通信を行う質問手段とから構成され、双方向無線通信が可能な無線LANあるいは携帯電話機として用いることができるように、無線タグ3との通信が可能である。無線通信装置9の双方向無線通信手段は、前記実施形態の無線通信装置5および7と重複する部分には同一の符号を付し、その説明を省略する。

【0096】無線通信装置9の双方向無線通信手段は、送信源40、変調器42、送信RF部43、送受信分離器45、双方向無線送受信・無線タグ送信共通アンテナ76、信号結合器56、受信RF部47、多機能復調器57、情報信号入力部50、および復調信号出力部51を含む構成される。また、無線通信装置9の質問手段は、送信源40、変調器42、送信RF部43、送受信分離器45、無線タグ3に信号を送信する無線タグ送信アンテナとして機能する双方向無線送受信・無線タグ送信共通アンテナ76、無線タグ受信アンテナ53、信号結合器56、受信RF部56、多機能復調器57、情報信号入力部50、および復調信号出力部51を含む構成される。

【0097】無線通信装置9の双方向無線通信手段と質問手段とは、基本部として送信源40、送受信分離器45、双方向無線送受信・無線タグ送信共通アンテナ76、信号結合器56、多機能復調器57等を共有化して用いる。

【0098】無線通信装置9は、無線タグ3から送信される信号を受信する無線タグ受信アンテナ53を備えるので、無線タグ3への送信信号は、他の無線通信装置と通信、つまり無線タグ3との通信よりも広範囲な通信を行う双方向無線送受信・無線タグ送信共通アンテナ76を用いて送信し、無線タグ3からの信号を指向性の高い無線タグ受信アンテナ53を用いて受信する。このように、指向性の高い無線タグ受信アンテナ53を用いることによって、無線タグ3からの微弱な信号を受信することができる。

【0099】無線通信装置9のRFID動作は、上述した質問手段を用いる。送信源40で発信した搬送波は、無変調ないし一部変調した状態で送信RF部43、送受信分離器45、双方向無線送受信・無線タグ送信共通アンテナ76を通して送出され、無線タグ3に至る。無線タグ3から返された信号は、無線タグ3受信アンテナ53で受信され、信号結合器56を介して多機能復調器57に入り復調される。無線タグ3の情報が復調信号出力部50から取り出される。無線タグ3からの返送される信号の一部は双方向無線送受信・無線タグ送信共通アンテナ76に入力されるが、これは送信RF部43の構成など

の工夫することによって問題にはならない。他の無線通信装置19との通信動作は、無線タグ受信アンテナ53は特に関与せず、図4の無線通信装置7と同様であるため、説明を省略する。

【0100】以上のように、双方向無線通信手段および質問手段で共通の部分を用いることによって、装置の簡略化および小型化を図ることができ、また製造コストを低減することができる。

【0101】本発明のさらに他の実施形態では、前記実施形態の無線通信装置9の多機能復調器57をキャリア再生型の同相検波方式を用いた多機能復調器10の構成もよい。図7は、本実施形態の無線通信装置10の構成を示す図である。本実施形態の無線通信装置10で、図5および図6に示した前記実施形態の無線通信装置8および9と重複する部分には同一の符号を付し、その説明を省略する。また、他の無線通信装置との通信動作およびRFID動作は基本的に前記実施形態の無線通信装置7と同様であるので、その説明を省略する。

【0102】図8は、本発明のさらに他の実施形態の無線通信装置11を含む無線通信システムの構成を示す図である。本実施形態の無線通信装置11で、前記実施形態の無線通信装置と重複する部分には同一の符号を付し、その説明を省略する。無線通信装置11は、前記実施形態の無線通信装置7とはほぼ同様な構成であり、無線タグ3へ信号を送信および無線タグ3から送信される信号を受信する無線タグ送受信アンテナ54と、他の無線通信装置19および無線タグ3との通信によって双方向無線送受信アンテナ86と無線タグ送受信アンテナ54とを切り換える信号結合器60を備える。

【0103】無線通信装置11は、他の無線通信装置19との双方向無線通信を行う双方向無線通信手段と、無線タグ3との通信を行う質問手段とから構成され、双方向無線通信が可能な無線LANあるいは携帯電話機として用いることができるように、無線タグ3との通信が可能である。無線通信装置11の双方向無線通信手段は、送信源40、変調器42、送信RF部43、信号結合器60、送受信分離器45、双方向無線送受信アンテナ86、信号結合器56、受信RF部47、多機能復調器57、情報信号入力部50および復調信号出力部51を含む構成される。また、無線通信装置11の質問手段は、送信源40、変調器42、送信RF部43、信号結合器60、送受信分離器45、無線タグ送受信アンテナ54、信号結合器56、受信RF部47、多機能復調器57、情報信号出力部50および復調信号出力部51を含む構成される。

【0104】無線通信装置11の双方向無線通信手段と質問手段を用いる。送信源40で発信した搬送波は、無変調ないし一部変調した状態で送信RF部43、送受信分離器45、双方向無線送受信・無線タグ送信共通アンテナ76を通して送出され、無線タグ3に至る。無線タグ3から返された信号は、無線タグ3受信アンテナ53で受信され、信号結合器56を介して多機能復調器57に入り復調される。無線タグ3の情報が復調信号出力部50から取り出される。無線タグ3からの返送される信号の一部は双方向無線送受信・無線タグ送信共通アンテナ76に入力されるが、これは送信RF部43の構成など

で、装置の簡略化および小型化を図ることができ、製造コストの低減が可能である。

【0106】無線通信装置11は、他の無線通信装置との通信を行う場合には、信号結合器60（本実施形態ではスイッチ）および信号結合器56であるRFスイッチを、送受信分離器45側に接続し、上述の双方向無線通信手段の双方向無線送受信アンテナ86を用いて通信を行う。一方、RFID動作の場合は、信号結合器60および信号結合器56を信号分離器44に接続し、上述の質問手段を用いて行われる。送信源40からの搬送波は変調器42、送信RF部43、信号結合器60、および信号分離器44を経由して無線タグ送受信アンテナ54から送出される。無線タグ3からの信号は無線タグ送受信アンテナ54で受信され、信号分離器44で分離され、信号結合器56、受信RF部47を経由して多機能復調器57で復調される。このように、他の無線通信装置または無線タグ3との通信の場合で、それぞれの通信に適したアンテナに切り換えられ利用される。

【0107】本発明のさらに他の実施形態では、前記実施形態の無線通信装置11の多機能復調器57をキャリア再生型の同相検波方式を用いた多機能復調器として示す図である。本実施形態の無線通信装置12の構成を付し、その説明を省略する。本実施形態の無線通信装置12は、他の無線通信装置と重複する部分には同一の符号を付し、その説明を省略する。本実施形態の無線通信装置12は、他の無線通信装置および無線タグ3との通信において受信した信号を、キャリア再生型の同相検波方式を用いた多機能復調器58で復調する。他の無線通信装置および無線タグとの通信動作は、前記実施形態の無線通信装置11と基本的に同じであるので説明を省略する。

【0108】図10は、本発明のさらに他の実施形態の無線通信装置13を含む通信システムの構成を示す図である。本実施形態の無線通信装置13は、他の無線通信装置19と通信を行う双方向無線通信手段である双方向無線通信部14および無線タグとの通信を行う質問手段である質問部15を含む構成される。

【0109】双方向無線通信部14は、図14に示した従来の双方向無線通信装置1と同様な構成であるのでその説明を省略する。双方向無線通信部14と質問部15とは脱着可能に構成することもできる。

【0110】図11は、無線通信装置13の質問部15の構成を示す図である。質問部15は、双方向無線通信部14のアンテナから送出される信号を直接受信する双方向無線受信アンテナ62、無線タグ3から送出された信号を受信する無線タグ受信アンテナ63、復調器64、信号処理部65および復調信号出力部66を含む構成される。

【0111】次に、無線通信装置13のRFID動作について説明する。双方向無線通信部14は、通信を行う

ためにアンテナ24から信号を発信する。アンテナ24は、図14に示した従来のアンテナ24と同じアンテナであるが、双方向無線装置との19との信号の送受信および、無線タグへの信号の送信、および質問手段のアンテナ63への信号の送信を行う。アンテナ24から発信した信号は、他の無線通信装置19に向けて発せられると同時に、ある距離に存在する無線タグ3にも至り、さらにアンテナ24の付近に近傍に配置される質問部15の双方向無線受信アンテナ62にも入力される。この送信信号の一部は、質問部15の無線タグ受信アンテナ63にも至るが、その大きさは双方向無線受信アンテナ62の指向性の設計によって調整される。たとえば、本実施形態では、無線タグ受信アンテナ63は指向性のある平面アンテナとし、質問部15の側面に配置する。

【0112】無線タグ3に入力された信号は、無線タグ3内に保存された情報で変調され、その変調信号は無線タグ3から放出される。この無線タグ3から放出された変調信号は、質問部15の無線タグ受信アンテナ63で受信され、同相検波器などから検出される復調器64に入力される。一方、質問部15は、双方向無線受信アンテナ62で受信した双方向無線通信部14のアンテナ24から送出された信号も復調器64に入力し、無線タグ3からの信号と混合復調され、無線タグ3から取り出された情報は信号処理部65を通して、復調信号出力部66から取り出される。無線タグ3から取り出された情報は、信号処理部65に蓄積されるか、または双方向通信部14によって他の無線通信装置19に送信することもできる。

【0113】また、無線タグ3において単純なASKなどで変調された場合、双方向無線受信アンテナ62は必ずしも必要でなく、無線タグ3からの変調信号を無線タグ受信アンテナ63で受信し、復調器64でAM復調することで、無線タグ3の情報を取り出すこともできる。【0114】このように、本実施形態の無線通信装置13では、双方向無線通信部24から送信される信号を用いて、無線タグ3から情報を取り出すので、質問部は大に簡略化され、また他の無線通信装置19との通信を行う際に無線タグ3の稼働を取りを行えば、電波を有効に利用することができる。

【0115】本発明のさらに他の実施形態では、図11に示した前記実施形態の質問部15のように、双方向無線通信部14からの信号および無線タグ3から放出された変調波を別々のアンテナで受信するのではなく、図12に示すように、同一のアンテナ67で受信してもよい。この場合、双方向無線通信部14からの信号と無線タグ3からの変調信号を1つのアンテナ67で受信するため両者の位相差を自由に設定することができ、そのため両者の位相差を自由に設定することができ、復調のため、これらの信号が特定の受信関係にあると、復調器65は同相検波方式であるので同相検波特有のノイズ

(特定条件で復調出力が0となる)が生じる。この問題は、たとえば特開平7-131403号公報に開示されている周波数ホッピング方式を用いることで解決できる。このような構成とすることによって、質問部16の

【0116】また、本発明のさらに他の実施形態では、図10に示した前記実施形態の双方向無線通信部14に、アンテナを2つ設ける構成としてもよい。図13は、本実施形態の双方向無線通信部17におけるアンテナ近傍の拡大図である。双方向無線通信部17は、従来の双方向無線通信装置1と同様と構成されており、アンテナの部分のみが異なる。本実施形態の双方向無線通信部17は、他の無線通信装置19との通信を行うアンテナ24の他に、無線タグ3に信号を送信する無線タグ送信アンテナ68および、アンテナ24と無線タグアンテナ68とを切り換えるアンテナ切り替えスイッチ69とを備える。無線タグ送信アンテナ68には、アンテナ24に比べて指向性が鋭いアンテナを用いることによって、無線タグ3との通信感度を高めることができる。

【0117】また上述した実施形態の無線通信装置4は、無線タグ3との通信において無線タグ3に搭載されている情報を読み取る動作についてしか述べていないが、無線タグ3への情報の書き込み動作は、通常実施例と異なるとして無線通信装置の送信信号にたとえばA S K変調を用えて、無線タグ3によって復調することなどによって容易に実現することができる。

【0118】 発明の効果）以上のように本発明によれば、他の無線通信装置との通信と、無線タグとの通信を同じ装置で行うことができる。したがって、他の無線通信装置との通信を行う装置およびの無線タグとの通信を行う装置の両者を個々に使う場合に比べ、装置の構成の簡略化および小型化を図ることができ、より低価格に装置を構築できる。

【0119】さらに、無線によって他の無線通信装置および無線タグとの通信を行うことで、固定利用に加え、屋内、広域などのモバイル環境において取得した無線タグ情報を、たとえば、この無線タグの情報を管理する遠隔の情報センタなどにも即座に送信することができ、また、情報センタから無線タグに情報を提供することもでき

【0120】また本発明によれば、他の無線通信装置との通信および無線タグとの通信を同一の送信機から発信させた信号を用いて行うことができるので、装置の構成を簡略化することができ、装置の小型化を図ることができる。さらに、製造コストを抑えることができる。

【0121】また本発明によれば、1つのアンテナで他の無線通信装置および無線タグとの通信を行うので、装置の小型化を図ることができ、装置の簡略化することができる。

ひ他の無線通信装置からの信号の受信を行うことができる。

【0132】また本発明によれば、送信機で発信した送信波を用いて無線タグから送信される信号を復調するの  
で、同期検波を行うための発信波別に作る必要がない。  
【0133】また本発明によれば、送信機で発振した搬送波の一部を取り出し、この搬送波を用いて無線タグから  
送信される信号を復調するので、同期検波のための発信波を別に作る必要もない。

【0134】また本発明によれば、質問手段は送信信号を保持なくとも、双方向無線通信手段のアンテナから無線タグへ信号を送信し、無線タグからの情報を受信することとがで、装置を簡略化することができる。さらに、他の無線通信装置への通信に際し散乱する通信エネルギーの無線通信装置への通信を行うことができるので、無線通信の省エネルギー化にも役立つ。

【0135】また本発明によれば、他の無線通信装置への信号の送受信と、無線タグへ信号の送信とを共通のアンテナで行うことよって、装置を小型化することができる。また、製造コストを抑えることができる。

【0136】また本発明によれば、他の無線通信装置への信号の送受信と、無線タグへ信号の送信とを別々のアンテナによって行うので、それぞれの通信に適したアンテナを用いて通信を行うことができる。

【0137】また本発明によれば、無線タグからの信号と、双方向無線通信手段からの信号とを同じアンテナで受信するので、装置を簡略化でき、小型化することができる。

【0138】また本発明によれば、無線タグからの信号と、双方向無線通信手段からの信号とを別々のアンテナを用いて受信するので、それぞれの通信に適したアンテナを用いて通信を行うことができる。

【0139】また本発明によれば、質問手段は送信線を保持したとしても、無線通信手段から他の無線通信装置へ信号が送信されると、同時に無線タグへも信号が送信され、また双方方向に無線、無線タグから返送される信号を受信し、それら無線通信手段から送信される信号を直接受信し、それらの信号を混合して処理するので、質問手段は送信線を保持したとしても、無線タグとの通信を行うことができる。

【0140】また本発明によれば、質問手段は1つのアンテナで双方向無線通信手段から送信される信号と、無線タグから送信される信号とを受信するので、装置の簡略化および小型化を図ることができる。

【0141】また本発明によれば、前記無線通信装置と無線タグとからなる無線通信システムを構成することができ、たとえば、質問手段によって無線タグから受信した情報を双方無線通信手段によって無線タグの情報を管理する管理装置などに即座に情報を送信することができ、また、無線通信装置は無線によって他の無線装置と通信することができる。

線通信装置および無線タグとの通信を行うので、設置などの制約がない。

【0142】また本発明によれば、前記無線通信装置によって無線タグに情報を書き込むことができる。したがって、たとえば無線タグの情報を管理する管理装置などから情報を無線通信装置に送信し、無線通信装置から無線タグの情報を送信して無線タグの情報を書き込むことができる。無線タグの管理を的確に行うことができる。

【図面の簡単な説明】

【図 1】本発明の実施の一形態である無線通信装置 4 を含む無線通信システムの構成を示す図である。

【図2】本発明の他の実施形態である無線通信装置5を含む無線通信システムの構成を示す図である。

【図3】本発明のさらに他の実施形態である無線通信装置6を含む無線通信システムの構成を示す図である。

【図4】本発明のさらに他の実施形態である無線通信装置7を含む無線通信システムの構成を示す図である。

【図5】本発明のさらに他の実施形態である無線通信装置8の構成を示す図である。

【図6】本発明のさらに他の実施形態である無線通信装置9を含む無線通信システムの構成を示す図である。

【図7】本発明のさらに他の実施形態である無線通信装置10の構成を示す図である。

【図8】本発明のさらに他の実施形態である無線通信装置11を含む無線通信システムの構成を示す図である。

【図9】本発明のさらに他の実施形態である無線通信装置12の構成を示す図である。

【図10】本発明のさらに他の実施形態である無線通信装置13を含む無線通信システムの構成を示す図である。

【図11】図10の無線通信装置13の質問部15の構成例を示す図である。

【図12】図10の無線通信装置13の質問部16の構成例を示す図である。

【図13】本発明のさらに他の実施形態の双方向無線通信部17のアンテナ近傍の拡大図である。

【図14】従来の双方向無線通信装置1の基本構成を示す図である。

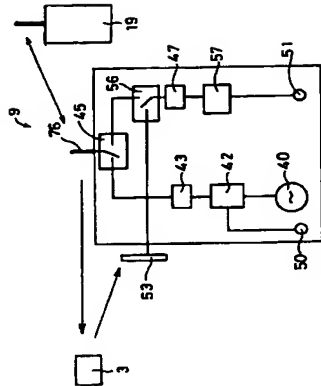
【図15】一般的なRFIDシステムの質問器2および無線タグ3を示す図である。

【符号の説明】  
3 無線タゲ  
4, 5, 6, 7, 8, 9, 10, 11, 12, 13 無線通信装置

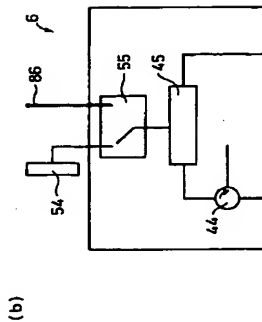
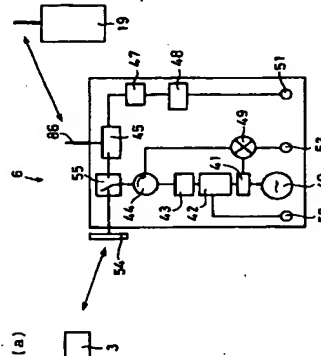
- 27
- 4.4 信号分離器
  - 4.6 双向無線送受信・無線タグ送受信共通アンテナ
  - 4.8 復調器
  - 4.9 無線タグ復調器
  - 5.3 無線タグ送受信アンテナ
  - 5.4 無線タグ送受信アンテナ
  - 5.7 多機能復調器
- 28
- \* 6.2 双向無線受信アンテナ
  - 6.3 無線タグ受信アンテナ
  - 6.4 復調器
  - 6.5 信号処理部
  - 6.8 無線タグ送受信・無線タグ送信共通アンテナ
  - 7.6 双向無線送受信アンテナ
  - \* 8.6 双向無線送受信アンテナ

- 27
- 4.4 信号分離器
  - 4.6 双向無線送受信・無線タグ送受信共通アンテナ
  - 4.8 復調器
  - 4.9 無線タグ復調器
  - 5.3 無線タグ送受信アンテナ
  - 5.4 無線タグ送受信アンテナ
  - 5.7 多機能復調器
- 28
- \* 6.2 双向無線受信アンテナ
  - 6.3 無線タグ受信アンテナ
  - 6.4 復調器
  - 6.5 信号処理部
  - 6.8 無線タグ送受信・無線タグ送信共通アンテナ
  - 7.6 双向無線送受信アンテナ
  - \* 8.6 双向無線送受信アンテナ

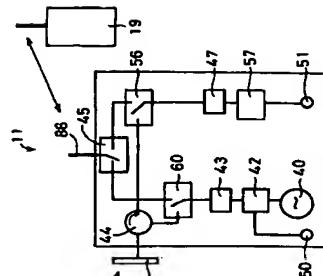
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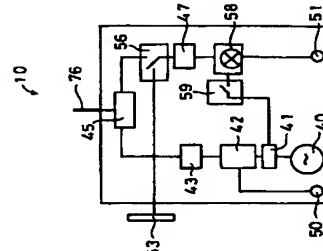
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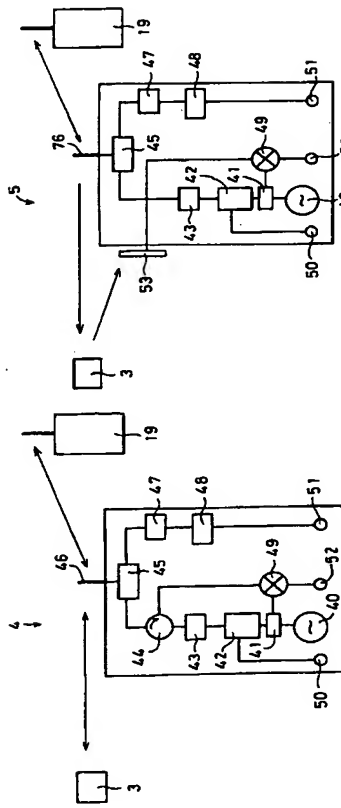
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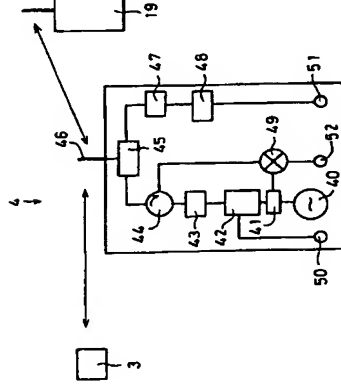
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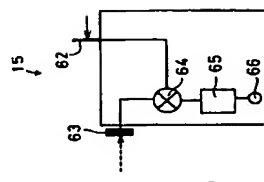
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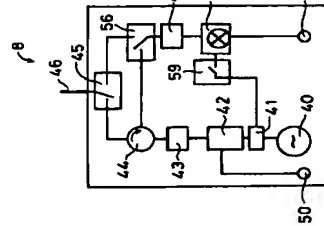
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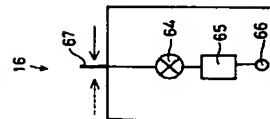
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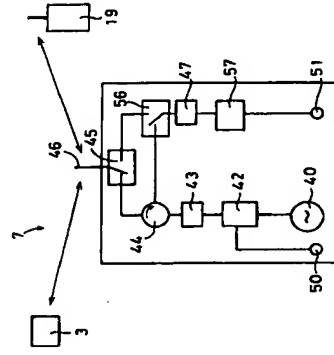
【図5】



【図12】

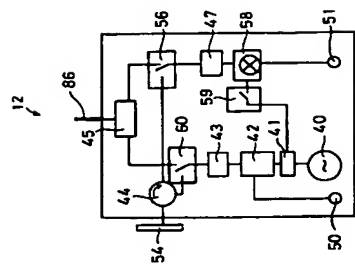


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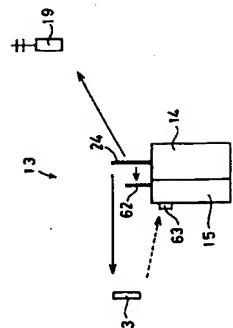




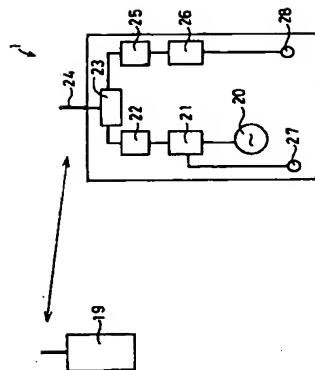
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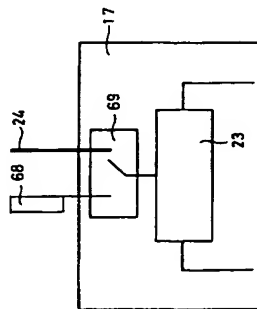
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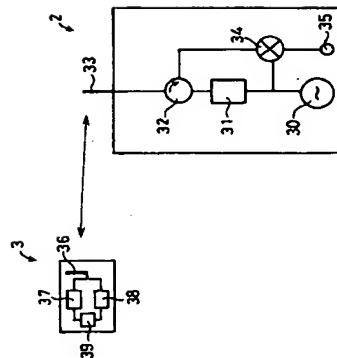
【図14】



【図13】



【図15】



フロントページの続き

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